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DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

August Bank Holiday Period Travel

IT does not seem possible to escape from the word "record" when examining the quantities of special passenger traffic conveyed by the railways for the many events, usual and unusual, which have occurred so far this year. A record of some sort is always being achieved, and the August Bank holiday period by bringing yet another has proved no exception. Increased prosperity in Britain, coupled with the most propitious holiday weather, resulted in some very heavy traffic figures, particularly on the Southern Railway, with its extensive holiday ramifications. Continental traffic on this system was the highest recorded for many years past, a total of 97,000 passengers travelling from Monday to Sunday, as compared with 76,000 for the same period in 1931 (the last year before the Continental passenger slump set in). For the week-end only, Friday to Monday, there were 141 boat expresses from London. On Friday and Saturday 220 additional expresses left the London termini, Bournemouth, Portsmouth, the Kent Coast resorts, Brighton, Worthing and Eastbourne being specially favoured. Over 137,000 passengers departed from London and the suburbs for the Surrey Hills and Thameside resorts. The L.N.E.R. ran 1,480 additional trains during the week end. Outstanding among these was the 10.45 p.m. from Marylebone to the North East, which eventually had to be run in no fewer than 15 parts. The G.W.R. dealt with 90,000 passengers at Paddington on Saturday. A liberal programme of special trains was provided by the L.M.S.R. The general position this year was affected by the increase in the number of firms paying for holidays, this being especially felt in connection with Stoke-on-Trent "Wakes" and the Birmingham area. On Friday the 4 p.m. and 6 p.m. train groups from Euston ran as 17 trains, and the 7.30 p.m. Royal Highlander in seven sections.

* * * *

Loud Speakers and Holiday Traffic

A valuable adjunct to the handling of large holiday crowds is the loud-speaker announcer in important stations, and during the past week-end many of these were so relied upon to direct the footsteps of holiday makers that it is difficult to estimate the amount of uncertainty and confusion thereby avoided. In some cases, however, the loud speakers would render valued service to an even larger number of travellers if more care were taken to select announcers trained in enunciation and with a minimum of dialect peculiarities—or to train announcers specially. At one London station we noticed bewilderment on more than one face at the valiant efforts of a 100 per cent. Cockney to imitate the speech of a B.B.C. announcer. In Birmingham, the "voice" we heard was of such undoubted Midland origin that even our fair working knowledge of most variations of the English tongue did not entirely suffice to interpret his directions. An excellent custom with loud speakers in Germany is for the announcer to preface his directions by saying "Hello-hello-hello," and thus give waiting passengers not only an intimation that instructions are about to come through, but also the indication of the pitch and voice in which they will be delivered.

* * * *

The Week's Traffics

The comparisons in the table below are made with the thirtieth week of 1936, which did not include the opening days of the August holiday. Comparing the present figures with the week including the corresponding part of the holiday week-end in 1936, however, increases in total traffics are £104,000 on the L.M.S.R., £60,000 on the L.N.E.R., £61,000 on the G.W.R., and £52,000 on the Southern Railway. The L.N.E.R. results are for the week up to Saturday, but the other three companies include the Sunday as well. All passenger receipts were higher, with a gain by the L.M.S.R. of £77,000 over the preceding August holiday as the greatest advance.

	30th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 72,000	+ 28,000	− 4,000	+ 96,000	+1,554,000	+ 4·30
L.N.E.R. ..	+ 58,000	− 6,000	+ 2,000	+ 54,000	+1,341,000	+ 5·13
G.W.R. ..	+ 32,000	+ 11,000	+ 9,000	+ 52,000	+ 788,000	+ 5·29
S.R.	+ 55,000	− 5,000	− 3,000	+ 47,000	+ 453,000	+ 3·82

London Transport receipts for the week are up by £5,200, and £5,100 above the corresponding holiday results last year.

* * * *

Interim Dividends

The interim dividend statement made by the London Midland & Scottish Railway Company on Thursday last week caused disappointment not so much in itself as by comparison with those previously made by the Southern and L.N.E.R. Companies. No interim dividend is to be paid on the ordinary stock, in contrast with forecasts of ¼ per cent. or even ½ per cent. Full interim payments have been or will be made on the preference stocks as in 1936. Only £310,000, or 22 per cent., of the increase of £1,410,000 in receipts has been retained as net. In the case of the L.N.E.R., there was an increase of £1,222,400 in gross receipts of railway and ancillary businesses and

miscellaneous receipts (net), and of this increase, £770,500, or 63 per cent., was retained as net. It is not clear, however, whether the figures of the two companies are compiled on a similar basis. The Southern definitely retained 44·38 per cent. net out of its increase in railway traffic receipts, but its increase in gross receipts from ancillary businesses was not stated. Last Friday afternoon the Great Western announced an interim distribution on the ordinary stock of ½ per cent., compared with ¼ per cent. at this time a year ago. Gross receipts from the railway and ancillary businesses for the half year showed an increase of £887,000, and the increase in the corresponding expenditure was approximately £347,000, so that the very satisfactory proportion of 60·88 per cent. of the gross increase has been retained as net. The net revenue from all sources for the half year shows the substantial improvement of £500,449.

* * * *

The Importance of the Preference Share

Those interested in the methods by which large business undertakings obtained capital during the industrial revolution and early railway age, will welcome a recent book by Professor G. H. Evans on "British Corporation Finance, 1775-1850." (Oxford University Press.) The importance and value of the railway preference share is fully developed by the author, for, to quote the introductory notice, the completion of a canal or railway was often a task of large proportions for the *entrepreneurs* of the late eighteenth and early nineteenth centuries. The mania for improved transportation had made relatively easy the raising of capital sufficient to cover the original estimates of construction costs; but, when the calculations of engineers proved to be defective and the undertakings were involved in costly revisions and delays, investors were not easily persuaded to advance the necessary additional funds. Moreover, Professor Evans says, stockholders of companies in financial straits realised clearly that money sunk into a canal or railway represented an investment in highly specialised capital goods, which would be unproductive should the completion of the undertaking become impossible. Other factors, such as the local nature of the transportation companies, increased the difficulties of raising additional funds. In these circumstances a new instrument of finance—the preference share—was developed, and provided the capital for the completion of many projects which otherwise might have been abandoned.

* * * *

Improvements at L.N.E.R. Passenger Stations

For some years now the L.N.E.R. has been a pioneer in the matter of painting stations in brighter colours and some very attractive decorative schemes have been produced. The commendation which has been forthcoming from the travelling public has convinced the company that further extensions of the programme are justified, and a comprehensive scheme has therefore been drawn up to deal with the 900 stations in the Southern Area, which extends as far north as Doncaster, and to Manchester and the Wirral Peninsula in the westerly direction. The Southern Area is divided into a number of administrative districts, and in every district a special committee has been set up to inspect such stations as are scheduled for periodical repainting, and to submit recommendations regarding appropriate colour schemes for the redecoration of the station, furnishing of the waiting rooms, condition of lavatory accommodation, siting of automatic machines, arrangement of advertisements, and the general appearance of the station as it presents itself to the passenger. These committees have been authorised to suggest improvements and any re-equipment that may be necessary to give stations a pleasing and tidy appearance, whilst at the same time providing the maximum possible comfort and convenience for passengers. Details of some of the major schemes appear on pages 250 and 255.

* * * *

"Private Owners'" Railcars

An innovation for which we are unable to recall any precedent in Europe is shortly to take place in Switzerland. For some time past various organisations in the Canton of Neuchâtel have contended that their local services were inadequate to the needs of the district, but the reply from the administration of the Swiss Federal Railways has been that they could see no economic justification for increasing them. After negotiations, therefore, various local authorities, organisations, and individual firms have raised the necessary capital for the purchase of a high-speed lightweight railcar, similar in design to the existing Swiss *Flèche Rouge* high-speed cars, and on delivery this is to be handed over to the Swiss Federal for operation exclusively in the region concerned. It will be known as the *Flèche du Jura*. Until the new car is ready, the Swiss Federal authorities have relented sufficiently to provide additional services, worked with a motor-coach and trailer, making four return trips daily from Bienne and two from Neuchâtel to La Chaux-de-Fonds and Le Locle and back. Another concession is a new *train léger* service from Basle at 11.35 a.m. to Lausanne, calling only at Délémont, Bienne, and Neuchâtel, and returning at 2.12 p.m.; this is run at the remarkably high average speed, in view of the gradients and curvature of the route, as well as its numerous single line sections, of 52·5 m.p.h.

* * * *

Soft Thirds in France

The expression "travelling soft" is quite common on the Continent to indicate travelling second or first class, as distinct from "travelling hard" in third class carriages, which, until quite recently, have generally been devoid of upholstery. Even now, with the introduction on most of the principal main-line systems of some covering over the boards of third class seats, the designation is scarcely inappropriate, for anything in the nature of sprung cushions in the third class is still rare. Nevertheless, with the steady decline in the numbers of first and second class passengers, and the recent great increase in the number of those travelling third in France, many of the superior class compartments have been given over for the use of the humbler passenger by the simple expedients of removing the antimacassars and floor rugs and changing the designation on the doors. Thus on branch line and omnibus trains may be seen third class accommodation greatly superior in comfort to that provided on much more up-to-date and important main-line expresses, although even on these we have seen at week-ends and holiday times second class compartments temporarily re-labelled third.

* * * *

Facts Belied by Figures

The modern fallacy of regarding figures as necessarily reflecting facts was well exposed recently by Mr. S. W. Fairweather, Director of the Bureau of Economics, Canadian National Railways, in an address at Kingston, Ontario. After indicating the difficulties that were placed in the way of the practical man by money restrictions, Mr. Fairweather outlined the real importance of the C.N.R., the largest railway organisation on the North American Continent. The Canadian National system, he pointed out, afforded the shortest railroad between eastern and western Canada with lower gradients than

any other line in the United States or the Dominion. In the prairie provinces the railway served the most productive part of the country. It served directly 90 per cent. of the people of Canada, and to a quarter of them was the only railway available. It linked the Dominion with many of Canada's best markets in the United States. Of the coal produced in Canada 60 per cent. depended upon the C.N.R. for rail transport. Development of base and precious metal mining in recent years had been largely along its lines. It was the greatest factor in serving the forest industries in Canada, originating more newsprint and pulp tonnage than any other railway on the continent. These were the facts of reality, showing the immense actual wealth represented in such a concern as the Canadian National Railways, the operating efficiency of which, Mr. Fairweather remarked, was steadily increasing from year to year. It is surely fallacious to judge such an asset on the statement that financial figures show the railway to be run at a loss.

* * * *

Speed in 1895 and 1937

A striking commentary on the increase that has taken place in locomotive efficiency during the past four decades is provided by a comparison of the performance of the L.N.E.R. Coronation express in 1937 with the fastest times achieved between King's Cross and Edinburgh in the historic Race to Aberdeen of 1895. On the night of August 21, 1895, the Aberdeen night "sleeper," weighing in all 110 tons, was worked from London to Edinburgh in 6 hr. 19 min.; today, with the 312-ton Coronation, the journey is made daily in 6 hr. Patrick Stirling's 8-ft. single-drivers worked the 1895 racing train from King's Cross to Grantham in 101 min., and from Grantham to York in 76 min., equivalent to a non-stop journey in 173 min. for the 188·2 miles; the present-day Coronation is allowed 16 min. less than this for its daily run. From York to Newcastle, and Newcastle to Edinburgh, covered by Worsdell 4-4-0 engines in 78 min. and 114½ min. respectively in the 1895 race (which is equivalent to about 191 or 191½ min. non-stop), the 1937 allowance is 200 min., but the latter allows considerably more margin for emergencies than the London-York schedule. The principal matter for comment, however, is that with an increase in locomotive weight of a little over 100 per cent., from 1895 to 1937, a train of nearly 200 per cent. heavier formation is being worked daily on a faster timing with one locomotive and one change of engine-crew than was possible with four locomotives and four crews, all working to their utmost capacity, in the famous contest of 42 years ago.

* * * *

A.T.C. on the Rock Island Line

The Chicago, Rock Island & Pacific Railway has had the Regan intermittent ramp system of A.T.C. in use, in conjunction with 3-position automatic semaphores, on 166 miles of double line between Blue Island and Rock Island since November 1, 1923, having installed it pursuant to Interstate Commerce Commission order of the previous June. The apparatus is now out of date and its manufacturer no longer in business, while maintenance costs are increasing. New diesel high-speed trains are to be introduced, and it is thought that the equipment is hardly good enough for such services. The semaphores, 30 years old, need replacing, and much new signalling work is called for elsewhere on the line. The company is therefore asking permission to abandon the A.T.C., on the understanding that the money saved thereby would be expended in a manner productive of a relatively greater degree of security. The safety record of the Rock Island line has long been good, and for 5 years at least there has been no accident attributable to non-observance of automatic signals, considerable extensions of which are now contemplated. It remains to be seen what the result of the company's petition will be. A.T.C. has been allowed to be abandoned on some lines in recent years, but continuous cab signalling has been substituted for it on others, such as the Pennsylvania, which has equipped its important main routes, but at what cost for installation and maintenance we have yet to hear.

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Non-Ferrous Brake Blocks

A matter of importance, in connection with the designing of brake apparatus for locomotives and trains, is the material used for the brake blocks. Attempts to introduce non-ferrous in place of cast-iron brake blocks have not until recently met with much success, for the reason that with the former, the coefficient of friction fell off very considerably when the rail was wet. The matter is of added importance at the present time, when very high speeds are coming into vogue on the railways, and it was therefore of interest and value that Mr. J. S. Tritton in the course of the discussion after the paper read by Mr. Graff-Baker on "The Retardation of Trains" at the Institution of Locomotive Engineers, should have given particulars of tests at which he was present, and which showed conclusively that wet conditions do not necessarily interfere with the effectiveness of the brakes. During these tests, which were carried out on a machine, the brake blocks were first run dry, and afterwards with a hose playing on them, and the total increased time to bring the flywheel to rest was in the nature of 0·5 second, so that the braking effects in both cases were practically the same. It was stated that trials on the L.M.S.R. had shown that non-ferrous brake blocks can be used successfully, and the speaker remarked that the stopping distance of a high-speed train had been reduced by something like 40 per cent. The significance of this does not need to be emphasised, but the figure given by Mr. Tritton suggests that such a result would apply only to really high speeds, and would possibly be attributable to some alteration in the brake rigging as well as in the material used for the blocks.

* * * *

Our Mouths Fall Open

In order to convince us of the superlative qualities of their products, watch manufacturers (in common with the fountain-pen fraternity) have done all manner of things to dazzle our prosaic minds and to bring from our lips the cry of "corluvaduck" or some similar expression indicating that our usual serenity has been disturbed and given place to wide-eyed incredulousness. Watches have been immersed in water for days on end, jumped upon, and even hurled to the ground from the Leaning Tower of Pisa, and after these trying experiences are invariably found still ticking in a most gratifying manner. True, no one has ever tried placing watches *under* the wheels of an express train, but now someone with an ingenuity redounding greatly to his credit has actually placed them *on* the wheels. Modestly described in a full-page advertisement in a well-known daily paper as "Wonder Watches' miracle ride," three of these timepieces made a journey recently from Swindon to London fastened to the driving wheels of the engine of the Cheltenham Flyer. A similar test was made on the Royal Scot and the watches survived both the journey and the Scots. On examination at the end of the journeys these watches were found to be showing the right time. Indeed we should not be unduly surprised if they have not added to their unsurpassed qualities the ability to cry "Cuckoo!" to mark the passing of each hour in an oft-times quaint world.

Systematic Train Services

IT is hardly necessary to stress the advantage of a train service which is worked at regular interval timings. It is an assistance to the passenger to know that at a certain time or times in each hour he may expect a train to start from the station of his choice for the destination he desires to reach; the knowledge renders the use of a timetable unnecessary, and may, indeed, change into an actual passenger, a potential passenger, who cannot lay hands on a timetable and therefore chooses some other mode of transport in case he should have a time-wasting wait at a station. One advantage of an electrically-worked train service is that it facilitates the establishment of systematic train times because the intervals necessary for attention to steam locomotives are eliminated; but the difficulties of systematically timing steam trains are often magnified, and evidence is available that regular interval steam services may be worked successfully.

It was in 1921 that the then London & South Western Railway introduced into Great Britain the first standardised timetable for main-line services, with the now familiar departure times from Waterloo at 30 minutes past the hour for the Southampton and Bournemouth directions, the even hours for the West of England, and ten minutes to the hour for Portsmouth. From that time forward there has been a gradual extension of regular interval departures on what is now the Southern Railway; in the suburban areas systematic timetables have been the inevitable outcome of electrification, and similarly with the extension of electric services to the coast, but steam services are still receiving constant attention in this direction, as is witnessed by the fact that for the first time this summer the Southern Sunday long-distance services from Waterloo have been made to conform in their departure hours—30 minutes past the hour from Waterloo to Southampton and Bournemouth and the even hours to the West of England—to those on weekdays. Similarly in the up direction departures from Southampton to Waterloo at 20 minutes past the hour are now standardised on both weekdays and Sundays. The only other British railway with regular-interval long-distance services from and to its London terminus is the Great Western, which in July, 1924, introduced a completely remodelled timetable; trains for the West of England were arranged to leave Paddington at 30 minutes past the hour; for the Bristol direction at 15 minutes past; for Birmingham and the North at 10 minutes past; and for the West Midlands at 15 minutes to the hour. In the reverse direction also departures for London were systematic, from Birmingham at the even hours; from Cardiff at 15 minutes past and Newport 20 minutes later; from Bristol at 15 minutes past; and so on. Unfortunately, however, in subsequent G.W.R. timetable changes the tendency has been departure from rather than development of the systematic principle —starting two of the Birmingham expresses from Paddington at 5 instead of 10 minutes past the hour is an example —and the passenger has not therefore the same certainty of finding a train for a specific destination at a specific time as he previously had. From St. Pancras, also, a certain amount of regular interval arrangement of train services has come into force, though here again there has been a measure of departure from the systematic times in recent years.

It is the London & North Eastern Railway that provides evidence of the practicability of a dense suburban service worked to systematic times as reliably with steam as with electricity. Probably the most striking reminder left in England by the late Sir Henry Thornton of his brief career as a railway General Manager is found in the suburban train service of the Great Eastern section between Liverpool Street and Enfield, Walthamstow, and Chingford, introduced under his *ægis* in October, 1920. With it he proved that steam could provide a systematic train service equal, except the rate of acceleration from stops, to that given by electricity; and it is still running efficiently to much the same timetable 17 years later. On Sundays the entire L.N.E.R. London suburban service from and to Liverpool Street and King's Cross, over all the suburban lines, is worked to a systematic timetable. Elsewhere on the L.N.E.R. the North Eastern Area has been gradually extending the scope of its regular interval services, which began nearly thirty years ago with the hourly express trains between Newcastle, Sunderland, West Hartlepool, Stockton, and Middlesbrough, until this principle has now become general on all the lines in the area lying between Darlington, Middlesbrough, and Saltburn in the south, West Hartlepool and Sunderland in the east, Bishop Auckland, Hexham and Carlisle in the west, and Newcastle and Tyneside in the north, worked entirely, save for the Tyneside lines, by steam. Passenger patronage of these services may be attributed at least in part to the convenience of their regular interval timings.

Much more might be done in this direction. Examples may be found here and there of express services with standardised departures; on other routes the timings are so nearly systematic as to make it remarkable that the necessary steps are not taken to reduce the departures to even intervals. For example, from Edinburgh, Waverley, express trains leave for Glasgow at 9.5, 10.0, 11.0 a.m., 12.10 (Saturdays), 1.0, 1.55, 2.55, 4.3, 4.55, 5.33, 6.20, 7.10, 8.55, and 9.45 p.m.; some of these certainly are long-distance trains whose departure from Edinburgh is dependent on their time of arrival from the south, but many of the trains are so near to the even hour that a sixty-minute service between the two capitals at the exact hours in each direction might be well worth trying. It should also be remembered that the value of systematic times rests largely on systematic running. With the gradual extension of regular interval electric services over the Southern main lines, for example, it is natural that the steam services using the same routes should gradually fall into systematic paths between the electric trains, but, if the working of so complex a machine is not to be seriously upset, strict punctuality of the steam trains is even more essential in such conditions than it was with the older and more casual arrangement of timetables. Thus systematic punctuality, which depends for its maintenance on the encouragement of the recovery of time lost by abnormal causes, should equally with even-interval train timing be a foremost aim of modern railway operation.

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Belgian Light Railways

THE Société Nationale des Chemins de fer Vicinaux which since 1885 has provided efficient and economical transport in Belgium by means of light railways frequently laid upon or alongside public roads, showed distinctly improved results in 1936 compared with the previous year. This improvement is the fruit of the policy steadily pursued for some years past of modernising the system so as to provide a more efficient and economical service. Part of the company's programme has been to replace steam services by railcars on lines where passenger traffic is light, and this was completed during the year under review. There are now 250 railcars in service and steam locomotives on these routes are now employed only in goods traffic and on special occasions. Electrification has also been steadily extended, and in 1936 1,319 km.

were electrically operated, compared with 1,267 in the previous year. Lines operated by steam or railcars increased from 3,863 km. in 1935 to 3,902 in 1936. As a result of the recovery in passenger traffic and the saving in fuel effected by the railcar services the number of lines worked at a loss has been reduced from 84 in 1935 to 61 in 1936.

On the steam or railcar-operated lines the receipts in 1936 were fr. 81,618,762, a net increase of fr. 7,876,652, or about 10·70 per cent., in comparison with 1935, notwithstanding a fall of over fr. 1,000,000 in goods traffic earnings. On the electrically-operated lines the receipts in 1936 amounted to fr. 164,944,548, an increase of fr. 13,561,252 in comparison with 1935, and represented 66·89 per cent. of the total earnings. Goods traffic has suffered from lorry competition. To assist in meeting this an arrangement has been made with the Belgian National Railways Company, whereby on interchange traffic between the two systems through rates on the national scale are to be charged, subject to a fixed tax of fr. 0·20 per ton-kilometre on the Vicinal portion of the journey. The accompanying table gives some operating figures for the light railway system as a whole:—

	1936	1935
Kilometres operated	5,221	5,130
Train-kilometres	62,582,813	58,324,916
Operating ratio, per cent.	97·45	100·36
	Fr. (Belg.)	Fr. (Belg.)
Passenger receipts	201,363,388	181,822,377
Merchandise receipts	42,014,606	43,083,940
Gross receipts	246,563,310	225,125,406
Expenditure	240,266,864	225,931,354
Net receipts	6,296,446	*Dr.* 805,948

Expenses on the steam and railcar-operated lines increased by only fr. 1,698,894, or about 2 per cent., notwithstanding an increase of nearly 20 per cent. in the number of train-kilometres, and the appreciable rise in the cost of materials and of labour, which shows the substantial economies effected in operation. In consequence, the operating ratio for these lines has been reduced from 114·29 per cent. to 105·34 per cent. On the electric lines expenses increased by fr. 12,636,616, with an increase of about 1,000,000, or 2·5 per cent., in the number of train-kilometres. The operating ratio on these lines was 93·54 per cent. in 1936, much the same as in the previous year.

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A Disastrous Blunder

THE story of the serious accident on the Southern Railway at Battersea Park on April 2 has now been told in Lieut-Colonel Mount's report summarised in this issue. Numerous important technical considerations connected with the signalling apparatus complicated the investigation and called for much care in the weighing of possibilities and probabilities, and the report is a longer one than usual. Some acquaintance with the details of Sykes lock-and-block and the different methods of working it adopted by the pre-grouping railways is necessary to understand the significance of certain of the factors contributing to the accident. As might have been expected in the circumstances, contradictory evidence was given at the inquiry in certain material respects; nevertheless, although a few minor doubts remain on one or two points, the main causes of the accident are quite plain.

The signalling apparatus is of the electro-mechanical type, installed when the Brighton Company rebuilt its Victoria terminus about 30 years ago, the signals being power operated and controlled by slide handles fixed above the mechanical levers working the points. These slides were fitted with a special miniature form of Sykes lock-and-block, which has remained in force ever since at the Battersea Park box. The so-called co-operative, or button, system of cancelling, which had just been developed, was applied to these electro-mechanical boxes, but not between the last one out—Battersea Park—and the signal boxes of ordinary type beyond with which it worked. Colonel Mount recommends, however, that it be added there, at least as far as the acceptance of incoming trains is concerned. As is well known, the purpose of cancelling apparatus, as hitherto generally understood, is not only to deal with a train which is signalled and not required to proceed, but also to remedy, if possible, any locked-up condition produced by a failure of some part of the equipment. The fear of delay if the cancelling apparatus itself failed to work, however, seems to have led to what can only be described as an undesirable instruction permitting the signalman to open the sealed case covering the Sykes mechanism and set things right by hand. This, of course, pre-supposed a more than usual knowledge of its technical details, and the danger seems to have been overlooked that a man might, in setting something right, as he thought, very easily set something else wrong, especially if labouring, as he might well be, under some excitement at the time. It is, in our opinion, to this instruction, since withdrawn, that the accident must largely be ascribed, and although it is easy to be wise after the event, we cannot help feeling that it ought never to have been issued. If it is unthinkable that a signalman should be permitted to open a point detector relay case and short circuit the detection because he believes—or even positively knows—that everything is right for a proceed signal to be shown, it seems to us equally dangerous to allow him, merely because he is persuaded that something has failed, to interfere in any way with the very mechanism that should be his safeguard.

Colonel Mount makes it clear that the origin of the series of occurrences which ended in a false clear starting signal being exhibited at Pouparts Junction box to the colliding train was a defect to which, to judge from several remarks in the report, this old miniature mechanism is rather liable, even with due care for its maintenance. We must confess, however, that we look on it as a very serious defect. Owing to a conflicting point lever being left in the wrong position due to the signalman's initial oversight—such as any man might commit at times—he was properly prevented from pulling the slide to clear the home signal for a South London line train to enter the station. But the mere attempt to do so enabled him—as it decidedly ought not to have done—to set the Sykes locking mechanism thereon to the locked position, just as if the signal had really been used for the train. When the position of the point lever was rectified the signal consequently remained irregularly locked The South London train was waiting, and so—at the up local home signal—was a converging train from London Bridge which should have followed the former into Victoria. The irregular signal locking—which seems to us quite contrary to the principles of lock-and-block—the signalman sought to cancel in co-operation with his colleague in advance, but in his flurry he undoubtedly pressed the wrong button, from among several in his box. Not obtaining the release, he was led to imagine that the cancelling apparatus itself was out of order. Under this delusion he acted on the above-mentioned instruction, and unsealed and opened part of the mechanism case to free the locked slide directly by hand. Precisely what else he did will apparently never be known, but it resulted in the gross irregularity of clearing the control on the Sykes up local line block plunger, previously used to accept the waiting London

Bridge train, and the false lowering of the electric semaphore indicator at Pouparts Junction, indicating there that another train might be offered forward. Whether or not this was followed by an " out of section " bell signal from Battersea Park to Pouparts Junction, and how the signalman at the former came to accept the Coulsdon train into the section already occupied, the evidence did not finally establish. The Battersea Park signalman was undoubtedly the human factor that erred, but it was the irregular signal locking, and the authority he was given to interfere with the mechanism, that started him on his career of blunders.

As we had expected, the abolition of manual signalling on this and other heavily worked sections of route where it yet remains is under consideration, and as it is only a matter of time before this is done, possible improvements to the existing apparatus present no great interest. It has admittedly given good service under trying conditions for a long time, but the great increase in traffic of recent years, resulting in a corresponding increase in the number of movements to be made by the signalman, has reached the limit of capacity of hand worked apparatus, and automatic working is becoming indispensable. Lock-and-block, at least from section to section, will still be used elsewhere, however, and the question of cancelling therefore remains of importance. To place it on a satisfactory footing the principle, adopted some time ago by certain lines in India and elsewhere, should be applied, and all cancellation of block acceptance made impossible once a train has passed the section signal in the rear. In this way the danger of two men getting at cross-purposes on the telephone and cancelling under a misapprehension is removed.

The collision would have been less disastrous had the motorman of the Coulsdon train realised sooner that what he saw was the back and not the front of a train. As Colonel Mount emphasised after the Welwyn collision, the tail signal is the " second line of defence " if some mistake is made and every moment is precious. It ought to be recognisable without hesitation, and when so much attention is devoted to making fixed signals conspicuous, the comparative neglect to improve the tail signals of moving trains is inconsistent. By day the backs and fronts of electric trains are very similar and some clearer distinction seems desirable. If the plain white square cannot be reserved on the Southern as a rear signal at all times we suggest that a plate, enamelled in bright colours like the French red and white chess-board signal, would make a good tail board to place over the square, making the rear of a train recognisable at a glance.

The telescoping of the rear coach of the standing train has again led to comment regarding all-steel construction. On behalf of the company the opinion was expressed that had the trains been so constructed the vehicles might have been thrown about in star formation; Colonel Mount considers it fortunate this did not occur as the accident was on a viaduct and it is impossible to say whether casualties would have been more or less serious. " Resistance to collision," he says, " is not the primary consideration in the design of rolling stock; nor can dynamics be eliminated by the use of what is called all-steel construction. But if wood is kept away from electrical equipment and coupling and buffer gear are adequate the passenger-carrying portion of the bodies even of motor coaches, on surface railways, need not necessarily be composed entirely of steel, if the various other considerations concerned do not justify such construction. It is clear that the right policy is to continue to direct available resources towards the prevention of accidents rather than towards minimising their effects." We agree generally with the last mentioned sentiment, but if coupling and buffer gear are made so good that telescoping does not occur the shock must still go somewhere, since dynamics are not done away with, and the vehicles must presumably still be thrown about, with occasional risk of falling off a viaduct. This risk might at times be serious, but on the whole we think we would sooner be in a strongly built vehicle that even went over the side of a viaduct—at least over one of the height concerned in this case—than in one that was telescoped as this one was, the inevitable result of which is so fatal to the occupants.

* * * *

125 Years of Railway Locomotives

WE have no wish to indulge in the task of reviving old controversy—largely unprofitable in any event—as to the measure of praise which is due to the respective pioneers who contributed to the successful introduction of the steam locomotive. Too often the protagonists of the claims of a particular engineer have argued heatedly about such questions as " when is a blast pipe not a blast pipe " without regard to the elementary facts that the possibility of steam traction was known long before the nineteenth century dawned, and that its commercial adoption and development awaited the financial incentive provided by the enormous rise in horse fodder during the Napoleonic wars. An anniversary falling during the coming week provides a fitting opportunity to recall some essentials of the momentous days when the railway steam locomotive embarked on a commercial career that was destined to change the face and habits of the civilised world.

The event to which we refer occurred 125 years ago, and was none other than the official inauguration of the first commercial use of a steam locomotive on a *railway*. As already stated, we have no desire to belittle the earlier work of Nicholas Joseph Cugnot, William Murdock, William Symington, Oliver Evans, Richard Trevithick, Timothy Hackworth (and/or William Hedley), and others. The fact remains that prior to 1812 none of these built a machine *with flanged wheels for railway service* that was used commercially. Thus the question of sufficient adhesion was not settled by the experiments of Trevithick in 1804 on the Penydarran tramroad, nor by those in 1813 on the Wylam line, for the former had always been a plateway laid with angle-iron rails and the latter, although originally a wooden wagon-way formed previous to 1763, was relaid with similar plates in 1808.

Bearing this in mind, it is understandable that John Blenkinsop thought it necessary to devise and patent a rack rail in 1811 when he decided to adopt steam traction on Brandling's wagon-way between Middleton and Hunslet (Leeds), and indeed it is improbable that, without the aid of the rack, Matthew Murray's locomotives would have been able to haul the heavy loads they were called upon to handle. The first of these engines were the *Prince Regent* and the *Salamanca*, and with them steam traction was officially inaugurated on this railway on August 12, 1812. According to the surviving evidence there can be no real doubt that this was the first successful commercial use of steam traction on rails, and that the engines were the first with flanged wheels to go into service. Two other locomotives (to which tradition has assigned the names *Lord Wellington* and *Marquis Wellington*) were added to the stock in 1813. So far from being a mere experiment, this pioneer venture in steam traction continued until 1835. Incidentally, it was left to George Stephenson's *Blucher*, which began work at Killingworth in July, 1814, to be the first adhesion locomotive to be used with flanged wheels—an important point in locomotive history that is not generally appreciated.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Baltic *versus* Hudson

Coll-Earn,
Auchterarder. July 12

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—Remembering the premier position in the railway world held by your excellent journal, I venture to make a suggestion on the "honour to whom honour is due" principle, because if you adopt a nomenclature all others will follow.

I would like to see you call the 4-6-4 type of locomotive the Nord, and not the Hudson, because the Nord of France brought the type out long before the New York & Hudson River RR. did, in order to haul the heavy Nord Express from Paris so far on its journey to the Baltic for St. Petersburg.

Yours faithfully,
NORMAN DORAN MACDONALD

[We are in complete agreement with Mr. Macdonald on the question of giving "honour to whom honour is due," and accordingly describe the 4-6-4 type as the Baltic—a name derived from the circumstances Mr. Macdonald mentions. The whole value of such nomenclature, however, lies in its general recognition, and were we to adopt the unfamiliar "Nord" we should fail in our effort to describe progress in language "understanded of the people."—ED. *R.G.*]

The Evolution of Railways

London, July 26

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—The question of the genesis of the present standard gauge of the English railways, so ably treated by Mr. Charles E. Lee in his admirable series of articles on "The Evolution of Railways," is a very interesting one. It would be interesting also to follow it up as it has affected railway development in other countries. Why, for example, is the Irish gauge different, and why should Russia be distinct? Why should the authorities responsible for the construction of railways in Australia have allowed the engineers to adopt three different widths of track? And why, O why! was the Uganda railway built to metre gauge when the British colonial African gauge had already been fixed at 3 ft. 6 in.? A similar anomaly exists in South America, where the Argentine gauge is 5 ft. 6 in., Entre Rios 4 ft. 8½ in., and the Brazilian 5 ft. 3 in.

No doubt the explanation is that it was left to the engineers on the spot to decide on the gauge. It is also true that railways in the early days were being designed and constructed in isolated places with little possibility of co-ordination of ideas and less of standardisation. Our own "battle of the gauges" may be recalled, as an example of the obstinate insistence of the engineers on their own particular theories. Another case in point is that of Spain, where the normal gauge is 5 ft. 6in. The reason for this is explained in "The Railways of Spain" as follows:—

It is commonly believed that the 5 ft. 6 in. gauge was adopted in Spain as a consequence of the requirements, from a strategical point of view, of the then Minister for War, but there is no foundation in fact for such a belief. The commission appointed in 1844 to report on the railway question in Spain laudably endeavoured to make such a recommendation as would give their country the most practical and scientifically perfect gauge. The report after insisting on the necessity of a uniform width of track through the country, mentions the diversity of gauges existing at that date, and refers specifically to the Great Western 7 ft., the original Yarmouth line of 5 ft., and the Dundee—Forfar railway, as well as the recommendation of one of the English Commissions to construct the Irish lines on a 6-ft. gauge, afterwards changed to 5 ft. 3 in. One of the earliest railways in Russia is also mentioned in the report as being of 6-ft. gauge. The report . . . finally decided to recommend a gauge of 6 Spanish feet (two "varas" or Spanish yards) or 5 ft. 6 in. English and this recommendation was accepted and embodied in all subsequent railway concessions. Curiously enough the French railways which were the only ones with which Spain would ever have physical connection, are not mentioned in the report, although the French railway law governing the early concessions, was already in force (1842). The Spanish report, after commenting on the different systems, states that while it is true that the 4 ft. 8½ in. gauge is the one most commonly adopted it is advisable, "in a virgin country and where an entirely new railway system is being organised" to increase the width between rails and so secure a road admitting of the ". . . rapidity and security obtained by the use of the most recently perfected locomotives."

Incidentally, in the case of Spain, the inconvenience due to the break of gauge and consequent transhipment of fragile merchandise was surmounted at one time by the use of vans with interchangeable axles, the vehicles running between Paris and Spain and Portugal under Customs seals.

Your obedient servant,
GEORGE L. BOAG

The Story of the Tawell Message

56, St. Germans Road,
Forest Hill, S.E.23
August 2

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In the article on the work of Cooke and Wheatstone in your issue of July 30, reference was naturally made to the message sent on January 1, 1845, from Slough to Paddington, describing the appearance of the murderer Tawell and which led in due course to his arrest for the crime. In his article in *The Times* of July 24, to which you make reference in the same issue, Sir Josiah Stamp included the story, which has been related many times, of how it was necessary to spell the word "quaker" as "kwaker," the first three letters of which so astonished the receiving clerk at Paddington that he kept on interrupting the signalling, until a "bright boy," who was fortunately on the spot, advised him to let the whole word be finished and then see what was meant. I am not aware what evidence is supposed to exist for this story but there seem to me sufficient grounds for receiving it with considerable doubt.

In the first place, the Wheatstone 5-needle instrument, or "hatchment dial," as it was called, could only signal 20 letters of the alphabet; C, J, Q, U, X, and Z were missing. It was thus necessary to spell "central" as "sentral," "correct" as "korrekt," "axle" as "aksle," "quite" as "kwite" and so on. The operators would thus be perfectly accustomed to receiving and sending words spelled in special fashion and "kw" would not surprise them at all. It must often have appeared at the beginning of a word. I believe your article to be correct when it says that the 5-needle apparatus gave place to the double-needle in 1843, because the number of line wires required for the former is known to have been found unnecessarily costly. Double-needle instruments were in use for some time in this country. The Tawell message was, I believe, sent with them, not with the 5-needle type, as has been sometimes suggested. The code alphabet used with the double-needle system is given in Shaffner's "Telegraph Manual" of 1859, an authoritative and painstaking work, and it is stated therein that "J, Q, Z are omitted and replaced by G, K, and S respectively." Trained operators were necessary to work these instruments, since knowledge of a code was wanted, and this makes it seem all the more improbable that a clerk at Paddington should have been so nonplussed by a form of spelling which was evidently quite well known and allowed for in the very rules of working. Perhaps this clerk and the "bright boy" are as mythical as some of the "facts" that did duty in another field until Mr. Charles E. Lee showed how fanciful was their foundation.

Yours faithfully,
T. S. LASCELLES

PUBLICATIONS RECEIVED

The Evolution of Railways. By Charles E. Lee, F.R.S.A. London: THE RAILWAY GAZETTE. 8½ in. × 5 in. 64 pp. Illustrated with photographs, woodcuts, and drawings. Price 2s. 6d. —It is with the "rail-way," in the strictly limited sense of that word, that the author is concerned; that is to say, his purpose has been to trace the development from transport by road to transport conducted with the joint use of flanged wheels and rolled rails, and by comparatively early days in railway history his task is complete. But it begins at a far earlier date than the railways of the sixteenth century which have been assumed by many to mark the beginnings of transport by rail, for Mr. Lee takes us back to nineteen centuries before Christ in tracing the stone-ways laid down by emperors of Babylon and Assyria. The author proves how, contrary to the general belief, the flanged wheel long preceded the "plate-way," which was designed merely to keep the wheels of ordinary road wagons running over a true surface and in a direct line; and information is given on many contentious points, such as the origin of the 4 ft. 8½ in. gauge, and of such terms as "tramway," "sleeper," and others. This information, furthermore, is based on most thorough and painstaking research—an invariable characteristic of all the author's work—and the authorities from whom he quotes are duly cited, so that the matters dealt with are put beyond the range of controversy. For this reason the book, small as is its compass, has an importance out of all proportion to its dimensions, and in days to come may well come to be regarded as the standard work on the subject. The matter was originally put together as a paper read before the Permanent Way Institution, and is already familiar to readers of THE RAILWAY GAZETTE as having appeared in serial form in this journal. The list of chapters with which the book opens is so devised as to provide an index to its contents.

CECIL J. ALLEN

A.C.E. (An illustrated account of what is seen from the compartment window of the Atlantic Coast Express). By S. P. B. Mais. London: Southern Railway, Waterloo station, S.E. 9½ in. × 8¾ in. 50 pp. Illustrated by Anna Zinkeisen. Price 2s. 6d.—There is a feeling of regret in consigning to the waste paper basket a book that has been a companion on a pleasant railway journey. Even a sevenpenny magazine, although sadly crumpled from being clutched by a hand that was also grappling with a suitcase, seems to enshrine something of the enjoyment. Therefore, all who feel such sentimental pangs will welcome "A.C.E.," a book that is not only a travel companion for the Atlantic Coast Express, but, designedly, a memento to recreate the atmosphere of a holiday trip whenever it is taken from the shelf. It is in this permanence of appeal, reinforced by the decorative illustrations on every page by Miss Anna Zinkeisen, that "A.C.E." is a novel departure in route books. The author, of course, profits by the extra space allowed him in the compass of a half-crown publication to amplify his directions of what to see from the windows of the Atlantic Coast Express with a more copious commentary than is usually possible for the compilers of similar works. Miss Zinkeisen, too, has more room to display her talents and enliven the pages with her sketches, for in place of the customary diagram showing on which side of the line features of interest are situated, this essential information is conveyed by printing place names in the text in red or blue.

Of course, it would have been unwise to forgo route diagrams altogether in dealing with a train having as many ramifications as the Atlantic Coast Express, and the purpose is served by an excellent folding map at the end of the book, showing the Southern Railway route to the West. Mileages from London to the principal places served by the Atlantic Coast Express are shown thereon in red, and numerous small photographic views typifying the widely varying scenery through which the train passes on its long run, are reproduced to arrest the attention of those for whom a map on its own account might exercise limited appeal. There is, indeed, something for travellers of all tastes in this book. Mr. Mais, whose word pictures of scenery need no introduction, has ranged freely through the historical, literary, and legendary associations of the places concerned, and Miss Zinkeisen supports him with equal versatility. Her attractive coloured front page is seen through a "window" cut-out in a cover designed to give the impression of a compartment interior.

Synthetic Rubber. By W. J. S. Naunton. London: Macmillan & Co. Ltd., St. Martin's Street. 8¾ in. × 5½ in. 162 pp. Illustrated. Price 7s. 6d. net.—The author of this book, Dr. W. J. S. Naunton, is head of the rubber laboratories of Imperial Chemical Industries Limited, and his book is claimed to be the first to deal with both the technical and economic aspects of synthetic rubber. An historical survey of synthetic rubber production leads up to a consideration of the chemistry of the subject, and so to the constitution of chloroplene, which is the parent substance of neoprene, a new I.C.I. synthetic rubber product. Neoprene is in no sense a proprietary name, but a word chosen to designate and describe an entirely new product. This substance combines with the elasticity and tensile strength of the best natural rubber, a very high resistance to oils and certain solvents. Its immunity to the effects of lubricants is expected to cause engineers to take considerably more interest in its applications than has been evinced towards other earlier rubber products.

After surveying the physics and technology of synthetic rubber, Dr. Naunton devotes a chapter to applications, concluding with the view that the development of new synthetic products, even though more expensive than natural rubber, ultimately redounds to the advantage of the material by enhancing its value in the eyes of industry. He suggests that as knowledge of the relations between the chemical and physical structures of synthetic rubbers increases, it should be possible to design such products for meeting particular sets of requirements.

Steel Foundries Calendar.—A most interesting series of colour reproductions from early railway lithographs enlivens the monthly pages of a calendar which we have received from the American Steel Foundries. Although naturally mainly of U.S.A. interest, some British favourites find a place, such as a view made in 1840 of a train on the Lickey incline, and one of J. C. Bourne's early scenes on the G.W.R. Among the American pictures, a particularly spirited one is "The Danger Signal," showing the crew of the *Jas. R. Pitcher* bringing their train to a stand with an alacrity doubtless increased by the fact that another train proceeding in the opposite direction on the single line is already in sight. We would also select for mention a set of views entitled "Early Scenes on the Pacific Railway," one of which shows a train drawn up alongside a signboard labelled "100th meridian; 247 miles from Omaha," the passengers having alighted in order to recline upon the ground for a few minutes at this geographically interesting spot.

Railway Wagon Discharging Appliances.—The rapid discharge of railway wagons containing coal or minerals in bulk with the least possible delay, is very necessary in modern circumstances. The mechanical discharge of railway wagons can be performed in a variety of ways, depending upon the conditions of the site and the class of wagon to be discharged. A 27-page brochure sent out by Babcock & Wilcox Limited entitled "Railway Wagon Discharging Appliances," a copy of which is before us, describes and illustrates apparatus for end, rotary, and side tipping of railway freight vehicles, and in addition, a locomotive coaling plant of the type which today represents one of the wide range of this firm's manufactures. Descriptions are given of the different types of apparatus, and these are aided by clearly-reproduced large-sized photographs, and a drawing showing the details of the Babcock & Wilcox electric tipping ram with cradle used for end tipping of wagons. Methods of discharging covered as well as open wagons are referred to in the brochure.

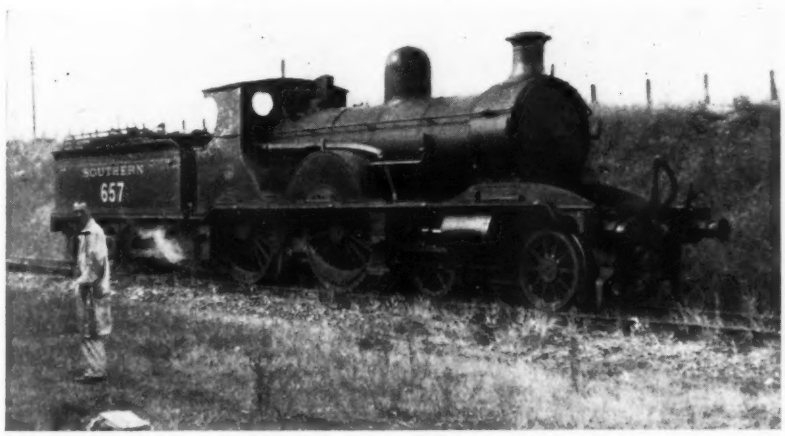
THE SCRAP HEAP

" OH, MR. PORTER "

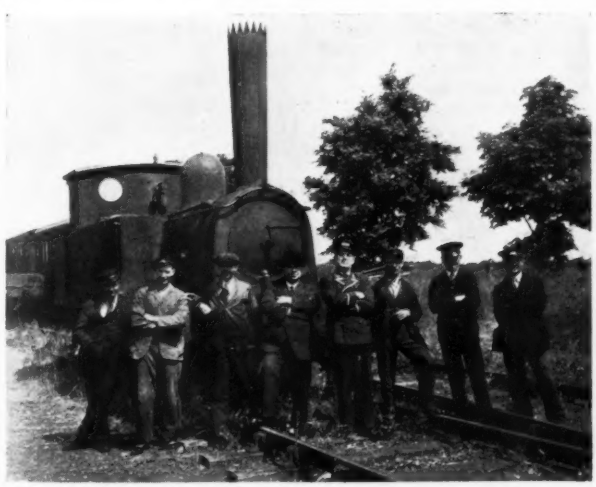
Cliddesden station on the abandoned Basingstoke and Alton line of the Southern Railway is now enjoying a fresh lease of life. Flourishing under the assumed name of " Buggleskelly " it is the scene of action of Will Hay's new film " Oh, Mr. Porter " now being filmed by Gainsborough Pictures (1928) Limited. The cast includes William Porter (Will Hay), Jeremiah Harbottle, Albert, and the redoubtable *Gladstone*, an ancient but stout-hearted engine (ex Kent & East Sussex *Northiam*). The story is briefly as follows: William Porter has been responsible for dozens of mishaps but the Superintendent dare not fire him—though he has longed to for twenty years—because William is related by marriage to the Managing Director. His wife has threatened to take him to live with her relatives if he loses his job on the railway. Eventually the Superintendent, in despair, offers him a small position at Aberdeen or Inverness, but William is determined to be a station-master. The Managing Director and the Superintendent find a vacancy at Buggleskelly, a small market town on the Southern Railway of Northern Ireland. The superstitious Irish believe that Buggleskelly is haunted. The sole staff of the derelict station are the ancient Jeremiah Harbottle and his assistant Albert. These two have not been paid for months, but live quite comfortably by stealing and by paying for goods with tickets belonging to the company. William tries to modernise Buggleskelly, and arranges an excursion. A one-eyed man buys all the tickets for the football team and William sees them off at 6 a.m. while Harbottle and Albert are sleeping off the effects of a brawl at the inn. Harbottle and Albert refuse to believe Will has really sent out an excursion, and tell the signalman to let the express through. To William's surprise there is no crash; his train seems to have disappeared, and there is consternation on the line. The villagers declare Will's one-eyed Irishman was a ghost, but he does not believe it and sets off with Harbottle and Albert in an ancient engine—*Gladstone*—to see whether the train is in a tunnel on a disused line. They find the train, and the one-eyed Irishman and his men loading it up with cases of arms. William realises they are gun-runners. The gun-runners chase William, Harbottle, and Albert up the hill and to the top of a windmill, where they escape by climbing out on to the sails. They uncouple the excursion engine, at the same time attaching *Gladstone* to the other end of the train. Then they dash along the line with the gun-runners aboard, not daring to stop lest the men should get out. Harbottle suggests throwing out a message in a bottle, to warn the police. Unfortunately *Gladstone* is now out of hand, and dashes into the terminus. William is congratulated by the Superintendent for capturing a notorious gang and modestly passes the laurels on to the old engine *Gladstone*, but alas! the strain has been too much for its inside—and it bursts and blows to bits!

Number plate of locomotive 657

A L.C. & D.R. axlebox on 6-wheel coach



Adams 4-4-0 with new chimney. (*S.R.* 657)



The celebrated "Gladstone," and part of cast

"Buggleskelly" repainted and en fête

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

INDIA

Wedgwood Committee Report

The report of the Wedgwood Committee has been received with mixed feelings. The opinion of the committee that the Indian railways are not likely over a period of years to earn more net revenue, after providing for depreciation, than will serve to meet their interest charges, has not been universally accepted. It will be remembered that Sir Otto Niemeyer placed considerable importance on the expectation of a substantial annual contribution from the Railway Department to the general exchequer as an integral part of the financial arrangements in the new constitution. Critics of the Wedgwood finding on this matter point to the Bengal & North Western, the Nizam's State, the Bombay Baroda & Central India and the East Indian Railways as undertakings which are capable of earning substantial surpluses after meeting in full their working expenses, depreciation and interest charges.

The recommendations on the road-rail question are generally considered satisfactory and the recognition of road transport as an important factor in the transport services in the country is greatly appreciated. Commercial opinion is, on the whole, pleased that the committee has ruled out any general increase in railway rates as a means of improving earnings. It is considered that the recommendation for the expansion of the Commercial Departments of railways, though desirable in many ways, should be approached with caution, particularly in the case of railways that are not earning sufficient net revenues to cover their interest charges. The proposals to accelerate railway transport both for passengers and goods, and to set up adequate machinery for the improvement of relations between the railways and the public are generally approved. The various Chambers of Commerce are expected to express their views on the report shortly. The report will also be discussed in the Central Legislatures. In the meantime, the Government of India has undertaken a detailed examination of the recommendations, and those that are finally accepted will be brought into operation without delay.

Rolling Stock Programme

The Standing Finance Committee for Railways met at Calcutta on June 28, with Mr. B. M. Staig, the new Financial Commissioner of Railways, as Chairman, to consider the rolling stock programme for 1938-39. In the original estimates submitted by the railway administrations, the programme totalled Rs. 5.27 crores. The estimates were revised by the Railway Board and proposals for the expenditure of Rs. 4.05 crores were placed before the committee, these comprising the following items:—

	Rs.
Locomotives and boilers ..	87,88,000
Carriages	1,38,00,000
Wagons	1,52,70,000
Railcars	26,80,000

The committee approved of the first three items and part of the last, the proposals for railcars submitted by the Eastern Bengal Railway being held over for further consideration.

New Type of Locomotive

The modest locomotive programme consists of 24 new broad gauge and 33 metre gauge engines, all replacements. As prices were on the rise and delay in delivery was expected, the Railway Board considered it desirable to place orders for the locomotives in anticipation of the sanction of the committee. Ten locomotives of a new design have been ordered to meet the need for replacement of smaller classes of engines. A new and improved type of engine has been designed, which should result in substantial savings and better running for the lighter kinds of haulage. Other locomotives ordered will have improved equipment.

Two Thousand Wagons a Year Ordered

The expenditure proposed under carriages provides for 17 upper-class (first and second class) carriages, 20 miscellaneous coaching vehicles, 52 composites with upper and intermediate or third class accommodation, and 276 lower class carriages. The bulk of the expenditure will be on lower-class stock.

The programme for general service wagons was considered, as in former years, in the autumn, when a survey of the goods traffic offering during the past months enabled the authorities to gauge the requirements for the next year. In the present year, the advance in the price of steel, which appears likely to continue for some time to come, had necessitated early action if reasonable prices were to be secured. The Railway Board, therefore, entered into a contract with Indian wagon-building firms early this year for the supply of 6,095 broad gauge general service wagons spread over the years 1937-38, 1938-39, and 1939-40. Under the contract, 2,095 wagons are due for delivery during 1938-39.

Railcars

An interesting feature of this programme lies in the request of three railway administrations for railcars to be used experimentally for the recapture of the short-distance passenger traffic lost to the roads. Though the advantages of road services are very considerable in some cases, it often happens that the provision of a fast and frequent service is the only factor that enables the bus to compete successfully with the railway. The present rolling stock of the railways cannot be run profitably on short and fast trips with small paying loads. The railcar meets the special requirements of this traffic and has been worked successfully under competitive conditions in many countries. In India, only six broad gauge railcars and one of narrow gauge are in service, on the M. & S.M. and G.I.P. Railways respectively, with more or less beneficial results. A meeting of railway agents and the Chief Commissioner of Railways in Bombay last year discussed the question of road competition. The experimental operation of railcars has since been considered in greater detail and the North Western, the Bombay, Baroda & Central India and the Eastern Bengal Railways have all submitted proposals for the inclusion of a number of railcars in the rolling stock programme for 1938-39. The N.W.R. wants 12 broad gauge units, estimated to cost Rs. 13 lakhs. The B.B. & C.I.R proposes to purchase 2 broad gauge twin diesel light units, at an approximate cost of Rs. 3 lakhs. The E.B.R. requisition is for 8 broad and 4 metre gauge railcars, valued at Rs. 10.8 lakhs; it is the approval of this proposal that has been deferred. In this connection it is important to note the opinion of the Wedgwood Committee that small self-propelled units were of dubious mechanical efficiency and traffic value.

Railway Labour Conference

The half-yearly conference between the Railway Board and the representatives of the All-India Railwaymen's Federation was to have been held at Simla on July 5. The meeting has, however, been postponed at the request of the federation to enable the latter to include in the subjects for discussion the recommendations of the Wedgwood Committee on staff matters.

BRAZIL

Paulista Railway

In accordance with a contract dated August 18, 1934, between the Paulista Railway and the Federal Government, whereby the North Western Railway Improvements Society was formed, and the Paulista undertook to continue constructional works on, and supply rolling stock to the North Western system, 2 locomotives, 11 passenger coaches, and 100 animal wagons were supplied. The new line in course of construction between Araçatuba and Jupiá was opened for traffic up to km. 115, and stone ballasting on main and other lines, where traffic is heavy, continued normally. Out of net profits amounting to 2,500 contos made by the society, 1,688 went to the railway, which, in addition, received 4,020 contos as its part of the 5,360 contos

amortisation instalment paid by the Federal Government. Against these amounts, however, the railway paid its fourth quota to capital, amounting to 6,000 contos of reis.

Results of Working in Recent Years

The annual general meeting of this railway was held on June 18, and the results of the year's working in 1936, to which brief reference was made in THE RAILWAY GAZETTE of May 14, were announced. Receipts and expenditure during the last five years compare as under:—

Year	Contos Receipts	Expenditure	Surplus
1932	103,740	52,655	51,085
1933	93,729	53,850	39,879
1934	107,481	58,022	49,459
1935	103,166	66,441	36,725
1936	116,324	71,240	45,084

The company transported, gratuitously, 42,285 immigrants with baggage, to the interior of the State of São Paulo, making a total of 1,279,366 immigrants carried in the last 54 years. Had this traffic been remunerative it would have produced 9,800 contos of reis.

Rolling Stock

In regard to rolling stock, 147 metre gauge wagons of various types were fitted with vacuum brakes, and 100 open metre gauge wagons and converted into special fruit wagons and adapted to the broad gauge. To cope with the increased traffic, 400 42-ton 5 ft. 3 in. gauge steel covered goods wagons were acquired, and put into traffic, as also 100 closed and 100 open metre gauge wagons of 30 tons capacity. Two ten-coupled locomotives were also purchased.

UNITED STATES

West Side Improvement, New York

The New York Central Railroad opened for traffic on June 28, the second stage of its great West Side improvement in New York. The whole scheme involves the removal of the company's freight lines from the city streets, and the construction of an alternative line—approximately 4 route miles in length—either above or below the street level, in a completely built up section; and the roofing-over of the tracks for several miles where they parallel Riverside Drive, so that a highway and parks may conceal the railway. The total length of the freight line being so intensively rebuilt is 13 miles.

The First Stage

The first stage of the scheme, which was completed in 1934, consisted of the building of a new goods depot near Canal Street in the lower (southerly) part of Manhattan Island to replace the old street-level St. Johns Park terminal which was demolished; and the construction of a double-line railway on a viaduct between the new depot and Thirtieth Street yard (approximately 2·3 miles), both seen to the right of the plan below. This section presents an unusual picture, since, where it was necessary for the line to pass through large buildings, the buildings were not destroyed but the viaduct was simply built through them at the first storey level. Since the opening of this section trains have been worked over it by diesel-electric locomotives.

The Second Stage (Below Street Level) Just Completed

The second stage of the work, just completed, consists of a new line (consisting of from 2 to 6 tracks) from Thirtieth Street yard northward to Sixtieth Street yard, a distance of about $1\frac{3}{4}$ miles. This section of the line, however, in contrast to the first stage of the work, has been laid down below the street level, in an open cutting, half of it excavated through granite. It passes under 24 intersecting streets and its construction necessitated the demolition of some 200 buildings. Operation here is by both diesel-electric and third-rail electric locomotives. An average of 30 freight trains daily each way run over this new section of the 13-mile total length of the West Side improvement.

The bringing into operation of this second stage of the work has virtually ended the railways' operation over the whole length within the city down the middle of 4 miles of city streets and has eliminated 105 level crossings. The third stage of the work—now well advanced—consists of the above-mentioned roofing over of the railway in the central part of the island in order to build an express highway and a park over it.

(Illustrations of the second stage are published on page 241*)*

CHINA

New Constructions and Surveys

The survey of the Canton-Meihsien Railway has now been completed and construction work will begin about August. The line will be some 250 km. in length and will traverse the whole length of eastern Kwantung. Arrangements are being made to train 400 students from schools in Kwantung for service on this new line. They are first to have two months' training in the Central Military Academy followed by a year of practical training on the Chekiang-Kiangsi Railway.

The survey of the Meihsien-Chaochow Railway has also now been finished and construction will begin shortly. The line will be 120 km. long, and will connect Swatow with Canton—and eventually with Nanking—when the Canton-Meihsien line is open.

Work on the Hunan-Kweichow Railway is proceeding rapidly. Work is in progress on the bridge across the Siang River and efforts are being made to complete the piers before the river comes down in flood. Sleepers for this line are being provided from home-grown timber and a large quantity have already been delivered.

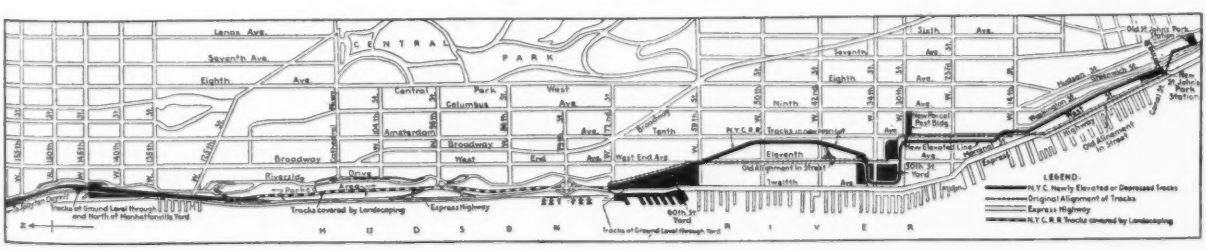
Construction work on the Tsinan-Liaocheng Railway will be put in hand in the near future.

Flood Damages

Floods on the Chekiang-Kiangsi Railway have interrupted traffic and trains for Hangchow from Nanchang had to be terminated at Chuki. The Puyang River overflowed its banks and flooded the line in two places. Construction work on the Nanchang-Pinghsiang extension of this line has also been interrupted on account of the heavy rainfall.

New Air Service

A new air service between Peiping and Hong Kong was inaugurated on June 29. The plane left Peiping at 6.04 a.m. and arrived at Hong Kong at 6.35 p.m. Delays of 15 min. each at Hankow and Changsha, where there were official receptions, will be avoidable in future, enabling the trip to be accomplished in 12 hr. over a distance of 1,455 miles. A connection will be made at Chengchow with the Shanghai-Sian route which will give a daily service to Nanking.



Sketch plan of the West Side of Manhattan Island, showing the location of the New York Central's West Side Line and the various sections of elevated, depressed and covered tracks. ***(Reproduced from our American contemporary the "Railway Age.")***

ISAAC DODDS: PIONEER RAILWAY ENGINEER

An inventor to whose genius is due much of the scientific advancement of railways

(From a correspondent)

THE railway age a century ago was prolific of inventions and there was no man of the period, rich as it was in eminent engineers, with a record equalling that of Isaac Dodds, the friend of George Stephenson. It is perhaps not too much to say that in some respects railways owe as much to Dodds as to Stephenson, but the latter, by virtue of achievements better calculated to appeal to the public imagination, has eclipsed his contemporary. Yet Stephenson constantly appealed to his friend and had supreme faith in his ability to solve any engineering problem with which he was confronted.

Dodds, who was the son of Thomas Dodds, a Durham colliery manager, was born at Felling Hall, Durham, on July 9, 1801. The father was killed in a colliery explosion at Hebburn in 1805, and Isaac was compelled by family misfortune to earn his own living at the early age of ten. He gained his engineering experience partly under his uncle, Ralph Dodds, at Killingworth colliery, and partly under George Stephenson at Newcastle-on-Tyne. Even as a lad, he revealed an unusual aptitude for mathematics, while as a draughtsman he had few equals. With these gifts he combined an intuitive perception of the fundamental principles of mechanics, and he established his reputation as an engine designer from 1832 onwards while with the Horsley Iron Company, which specialised in railway materials. Between 1833 and his death he was responsible for no fewer than 60 inventions; he died on November 1, 1882.

In 1835 Dodds was awarded two medals by the Society of Arts for inventions of the utmost value in industrial operations. The first medal was for his discovery of an improved parallel motion, which he applied to wood-working machinery and to engines of the vibrating pillar type for guiding the motion of the piston rod in place of the crosshead and guide bars. He demonstrated the utility of his principle by building a steamboat engine and several marine engines according to his own specifications, the first of the kind ever known. His second invention was still more noteworthy, consisting of an improved fusible plug which, it is claimed, prevented thousands of disastrous boiler explosions and consequent loss of human life. Just before, he had invented a machine for rolling plate glass, and after the fusible plug invention he evolved a new method of casting light railway wagon wheels, which won him further recognition from the Society of Arts.

Dodd's industry was amazing. He supplied the designs of the rolling stock for the Dublin & Kingstown Railway, and while acting as resident engineer of the Sheffield & Rotherham Railway constructed an engine which he fitted with one of the earliest known forms of valve gear providing for the expansive work of the steam. He concentrated for some years on the improvement of railway appliances, producing among other things the first successful reversing motion, as well as the punching bear, the shearing machine, and the jim crow, as now used by platelayers.

Then he set about the simplification of the method of turning engines, at this time a slow and laborious process, and the result of his efforts was seen in the invention of the locomotive engine turntable, pivoted in the centre and supported at each end. His next discovery was the volute spring, which revolutionised the construction of buffers, entirely displacing the ordinary "dead" buffing beam. In conjunction with William Owen, he carried the heavy forgings process to an advanced stage, turning out railway wheels of wrought iron; cranks; and crankshafts; and other similar productions of a kind which materially helped in the advancement of engine construction, and the improvement of railway rolling stock.

He found the couplings of railway carriages very primitive and unsatisfactory, and in order to ensure greater steadiness of running designed the method of applying springs to the buffers of railway vehicles so as to prevent the lateral motion from being transmitted to the carriages. There was no phase of railway engine shop work which escaped his attention and did not benefit from his innovations. It was Dodds who led the way in the improvement of railway switches, and the changes he introduced in the working parts of engines, all making for increased efficiency, durability, and economy, were legion. He perfected the first double-acting air pump; introduced horizontal cylinders in place of the vertical cylinders originally favoured; and was the first to apply metallic packing to the piston heads, reducing the cost of lubrication.

Dodds was one of the earliest advocates of steel rails, stoutly maintaining their superiority over iron in face of the pronounced prejudice of contemporary engineers. It may be doubted whether the services he rendered to railway development in this direction, vital in their influence from a constructive standpoint, have ever been sufficiently appreciated, and they were certainly never adequately rewarded. He had to fight his battle practically unaided and he spent money freely to demonstrate the advantages steel offered in comparison with iron, not only in lengthened life but in general superiority in other respects, and not least as an economical proposition. What the struggle cost him was never known outside the circle of his intimate friends, but he found consolation for his sacrifices in the knowledge that his efforts were not expended in vain.

Apart from the Sheffield & Rotherham and Dublin & Kingstown lines, he found scope for his activities as a practical engineer in assisting in the construction of the Monkland & Kirkintillock, the Caledonian, and the Lancaster & Carlisle Railways, and he was also identified with the building of the Spanish railway from Santander to the Castile canal at Alar Del Rey. Moreover, he introduced wrought-iron plate girders in bridge building, and helped Robert Stephenson in bringing to success his plans for bridging the Menai straits and the Conway river.

Dodds gave many striking proofs of his versatility. On one occasion he was informed by George Stephenson that his name had been entered in a competition at Newcastle for the best design of weighing machine suitable for coal carts or wagons. He protested that he knew nothing of the subject, but Stephenson replied: "Isaac, thou can'st invent anything; thou hast three weeks to think it over and make the model in; try for it!" Dodd's model did not reach the adjudicators until half an hour after the other entries had been received, but it was far superior to anything else sent in and was awarded the prize. It was Dodds who first designed a locomotive capable of working 200-ton trains on inclines of 1 in 50, in place of the old and unsatisfactory rope haulage system; and in other spheres he invented a window blind cord stretcher; a compensating pendulum for clocks; improvements in firearms; a new type of undershot water-wheel; and devices for the supply of gas for illuminating purposes.

THE DESIGN AND OPERATION OF CAPSTANS—II*

Alternating current drive, and mechanical features of wire-rope capstans

By B. J. DALZIEL, Late Assistant Electrical Engineer, L.M.S.R.

As three-phase current became available, railway engineers began to consider designs for simplified capstans, taking advantage of the easy starting of squirrel cage motors by throwing them direct across the line. Thus, except for the single main switch, switchgear and the effects of its misuse are eliminated, and both first and maintenance costs reduced. The single main switch had, however, to be fitted with overload releases to protect the capstans against attempts to subject them to pulls much above their rating. The switch thus fitted, together with a brake which was sometimes electrically and sometimes mechanically operated, was the only apparatus extraneous to the bollard itself and its motor and driving gear. Such capstans were not, however, produced commercially in the early days, and it was left to railway engineers to evolve original designs themselves.

Though the acme of simplicity appeared to have been reached, those responsible for the conception and design of these capstans were not yet out of the wood. The inherent characteristic of the squirrel cage motor, like that of a d.c. shunt motor, is of constant speed, and from this flowed various effects; in the first place the chosen bollard speed for a normal duty capstan dealing with various loads had to be a compromise between that required for heavy and light loads. Where only light pull was required, the speed could be increased permanently to suit, but such conditions occurred very rarely in a normal shed or yard. Furthermore, the absence of any appreciable speed-drop in the characteristic made it impossible to apply pull to the train of wagons without snatch on the ropes, and this caused heavy breakages and expensive replacement costs.

Curiously enough it was found impossible to start gradually by slipping the haulage rope on the bollard until the load was sufficiently accelerated. The rope either slipped altogether with a certain number of turns round the bollard, or gripped hard with the addition of a single turn notwithstanding any effort of the capstanman to vary the pull on his end of the rope as he paid it off. This was especially the case where the capstans were driven from 25-cycle current. Moreover, capstans worked from such a supply were found to impart to the rope a continuous periodic jerking or sawing motion which was too hard physically on the capstanman for them to be able to work the capstans under such conditions, so that no attempt at slipping the rope was possible.

Why this effect should develop on 25-cycle and not appreciably on 50-cycle current was never ascertained. As capstans had to work on 25 cycles, the practical problems were to make them do so, to reduce rope wear and breakage, and if possible to improve the speed characteristic. It was not of any great importance that a motor highly efficient in current consumption against duty should be used in such capstans. Compared with the energy consumption of hydraulic capstans, that of the electric was negligible in any case, and the real test of efficiency was suitability for duty. After some consideration it was decided to fit motors having rotors of such high resistance that they would stall down to zero on first application of load, and would definitely be limited in torque to a predetermined overload value, generally 100 per cent. over full load. These capstans were at first built individually for one of two available speeds respectively suited to the different conditions above mentioned, but it was found that the high-speed type was capable of being adapted to both set of conditions, as, though it tended constantly to accelerate on heavy loads, it did not do so rapidly enough to bring the speed of a heavy train or raft of wagons beyond suitable limits. Of course the speed drop due to the resistance of the rotor contributed to this, whereas on light traverser and turntable loads practically full speed was attained.

Unquestionably the heat developed on these high resistance rotors was considerable, but by the use of suitable varnishes and solid insulation of the coils the heating effect was counteracted and an adequately long life obtained on the windings; an eminently satisfactory capstan resulted, equalling a hydraulic capstan in its range of suitable speeds, having a better maintained speed on load and a higher overload capacity, and doing its work with a far less consumption of energy; also it was simple in construction to the last degree, not even the overload preventive coils on the thrown-in starting switch being necessary in view of the load limiting features of the motor itself.

The high economy in energy of electric capstans as compared with hydraulic (even with motors of relatively low efficiency as described) has facilitated changeover from hydraulic to electric operation of the machinery of yards and sheds, with an increase in economy. Investigations conducted in various yards of the late Midland Railway for example showed that not only were the hydraulic capstans the main power consumers, but that a few only of the total installed gave rise to a high proportion of the load. It was thus possible by converting only these few of the capstans so to reduce the hydraulic load—in the case of some large yards to less than half—that it could be dealt with by a comparatively small pumping capacity of electrically driven pumps, while the added electrical demand arising from the converted machines was insignificant.

Types of Capstan with Wire Ropes

Of the various forms of capstans in use, the fixed bollard loose rope type is by far the most prevalent. It is also the simplest and is used exclusively with hemp ropes. There have been cases where wire ropes have been used with such capstans, but these speedily destroy the bollard by grooving it; moreover any loose broken strand of wire is liable to wound the men's hands, and the ropes even when sound are uncomfortable to work. In the case of the fixed wire rope capstan, which is generally, though not always, of the free bollard type, the same problems are presented with regard to motor characteristic as those already enumerated, and are even emphasised owing to the rope being fixed, and comparatively inelastic.

The free bollard type of fixed wire rope capstans is so called because the bollard can be released by a clutch so that the rope can be pulled out by hand. This clutch is sometimes of the claw type and sometimes of the friction type; in the latter case it may be adjustable to protect the rope by slipping and preventing snatch on starting up. Experience indicates, however, that such adjustment is not altogether reliable, and requires more attention than it is likely to receive. To ensure adequate pulling

* Part I appeared on pages 149 and 150 of our issue of July 23.

power during actual haulage, the slipping point tends to be set at a higher figure than is required to protect the ropes in starting. Protection against snatch should, therefore, be provided electrically, though the additional mechanical protection of the friction clutch is at least advantageous, and in fact in these capstans is necessary as protection against the inertia of the rotating parts.

A brake is of course essential in any case to stop the bollard within the required number of revolutions on switching off. In the case of wire rope capstans, both d.c. and a.c. driven, it must also be designed to play a part in facilitating starting up and (as described later) the application of pull to the load without snatch, and it must also hold the bollard against the back pull of the spring of the rope, when the latter is tightened on to the load but for the moment power is not actually being applied. In the sequence of starting operations the application of the clutch must come first and be independent of the release of the brake, which must come subsequently.

Direct current capstans of the wire-rope type with resistance starting can in general be started up and pull applied without undue snatch if the resistance is used to supplement the "falling with load" characteristic of the series motor so as to give a gradual start. The resistance should, however, be of sufficiently high ohmic value to keep the speed down even on light load when hauling in slack rope, in order to ensure a fall in speed, preferably down to approximately stalling point, as the rope tightens. If before this too much resistance is cut out so that the motor speed is then too high, snatch will result from the mechanical inertia of the moving parts, apart from any effect of the electrically developed pull, and it is in these circumstances that some protection is afforded by the slip of the friction clutch. This is gone into more fully below in connection with the three-phase capstans of this type.

In the case of three-phase capstans, a motor of the same high resistance rotor type should be used as already described, with drooping characteristic and predetermined stalling or maximum torque, but this is insufficient to prevent snatching with a fixed wire rope. The starting problem is the same whether the capstan be of free or fixed bollard type. In the former case the clutch must obviously be engaged before starting up; the difference in operation between the two lies in the motor of the fixed bollard type having to be reversed to pay out the rope. Such capstans are in some cases pedal operated, with a separate pedal or lever for engaging or disengaging the clutch in the case of the free bollard type, but are also frequently remote controlled by master controller or push button. In passing it may be noted that not only in these, but in all cases both of pedal operated and remote control capstans it is advantageous to mount the main switch. resistances, and all other possible electrical parts above ground away from the capstan box; this improves working conditions and accessibility, and facilitates maintenance.

The electric limitation of torque does not fully overcome the adverse conditions arising with fixed wire rope capstans. Clearly, if the motor is switched on full having nothing to do but gather in the slack of the wire rope, it will in most cases have accelerated to full speed before tightening the rope on to the load. As the rope has very little elasticity when it comes to the tightening point under these conditions, a severe snatch on it and on the load is unavoidable and may cause damage to wagons, &c. The electrically produced torque will certainly be limited, but the mechanical snatch will be severe, and can be reduced only partly by the mechanical torque limitation provided by slipping the clutch.

In capstans of this type with which the writer has had to do, the motors were of the torque-limited type and the friction clutches had predeterminable overload adjustment providing an ultimate mechanical safety limit. Further provision was made, however, to eliminate snatch in the final application of pull to the load. This took the form of providing conditions of starting and hauling in slack under which torque was still further electrically limited. In starting up, the clutch was first applied and then, simultaneously with the release of the brake, there was inserted into the stator circuit of the motor a resistance or reactance of such value as to bring the motor torque (which varies as the square of the applied or effective voltage) down to a level just sufficient, with an adequate margin, to pull in the slack, the motor stalling immediately the rope tightened up enough to produce any appreciable load.

In most cases, owing to the weight of the rope being taken up gradually, and in a measure to its elasticity, the load on the motor does not rise suddenly, and its fall in speed takes place over a period sufficiently long to eliminate mechanical inertia effects. If, however, conditions are such as to cause the load to rise suddenly, the operator should switch off just prior to the rope finally tightening up, leaving the clutch engaged; not only will any possible mechanical snatch be thus minimised, but it should be obviated altogether by the kinetic energy being taken up on the brake. In addition, with the clutch remaining engaged the brake will continue to hold the rope taut on the load, so that no repetition of the process of tautening the rope is necessary.

Under the first conditions described above, the motor can be switched directly over on to the full mains pressure immediately the rope tightens up; under the second conditions it can be restarted through the resistance position, and then at once be put over to full pressure position without any slackening of the rope or any snatch on it. In neither case is the load subjected to any greater pull than approximately double full load. This requires more of the operator than the mere depression of a pedal, but the additional movements and their appropriate operations are within the capabilities of any reasonably intelligent man, and certainly do not make any greater demands than the double movement of engaging the clutch and then switching on entailed with the usual type of d.c. free bollard machine. As in the case of the standard fixed bollard capstan with loose rope, the motor constructed as described is necessarily not of very high efficiency in relation to energy consumption, but it makes a very effective capstan motor.

(To be continued)

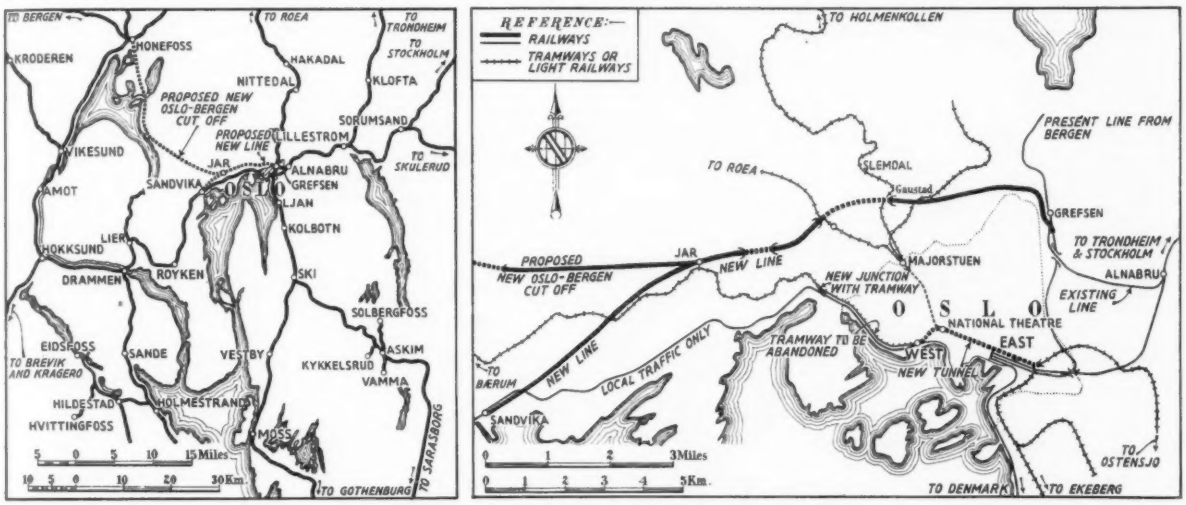
A USEFUL BALLAST TAMPER.—A simple electric tamper, with blades suitable for different types of service, is now produced by C. H. Johnson & Sons Limited, of Manchester. It is known as the Universal electric tie tamper, and can be handled independently by one man within a range of about 600 ft. from the power unit. One of the most useful types of blade has three prongs which can be shortened or lengthened to meet varying conditions encountered in ballast digging, loosening and cleaning operations. With the prongs reversed so that the blunt ends are in contact with the ballast, the machine is ready for tamping the cleaned ballast, particularly in lifts of from $\frac{1}{4}$ in. to 2 in. These universal electric tampers are furnished in three sizes, namely, 2-tamper, 4-tamper and 8-tamper outfits, with compact lightweight and easily portable power units. The tamper motor is $\frac{1}{3}$ h.p. and operates on 110-volt 3-phase 60-cycle current. No brushes, brush holders, springs or small parts are used, and the tamper blade delivers 3,600 blows a minute. A useful feature is that the semi-rigid handle is so designed that vibrations do not reach the operator.

PROPOSAL FOR A CENTRAL STATION AT OSLO

A scheme for concentrating all main line traffic in one station in the Norwegian capital and separating it from local lines

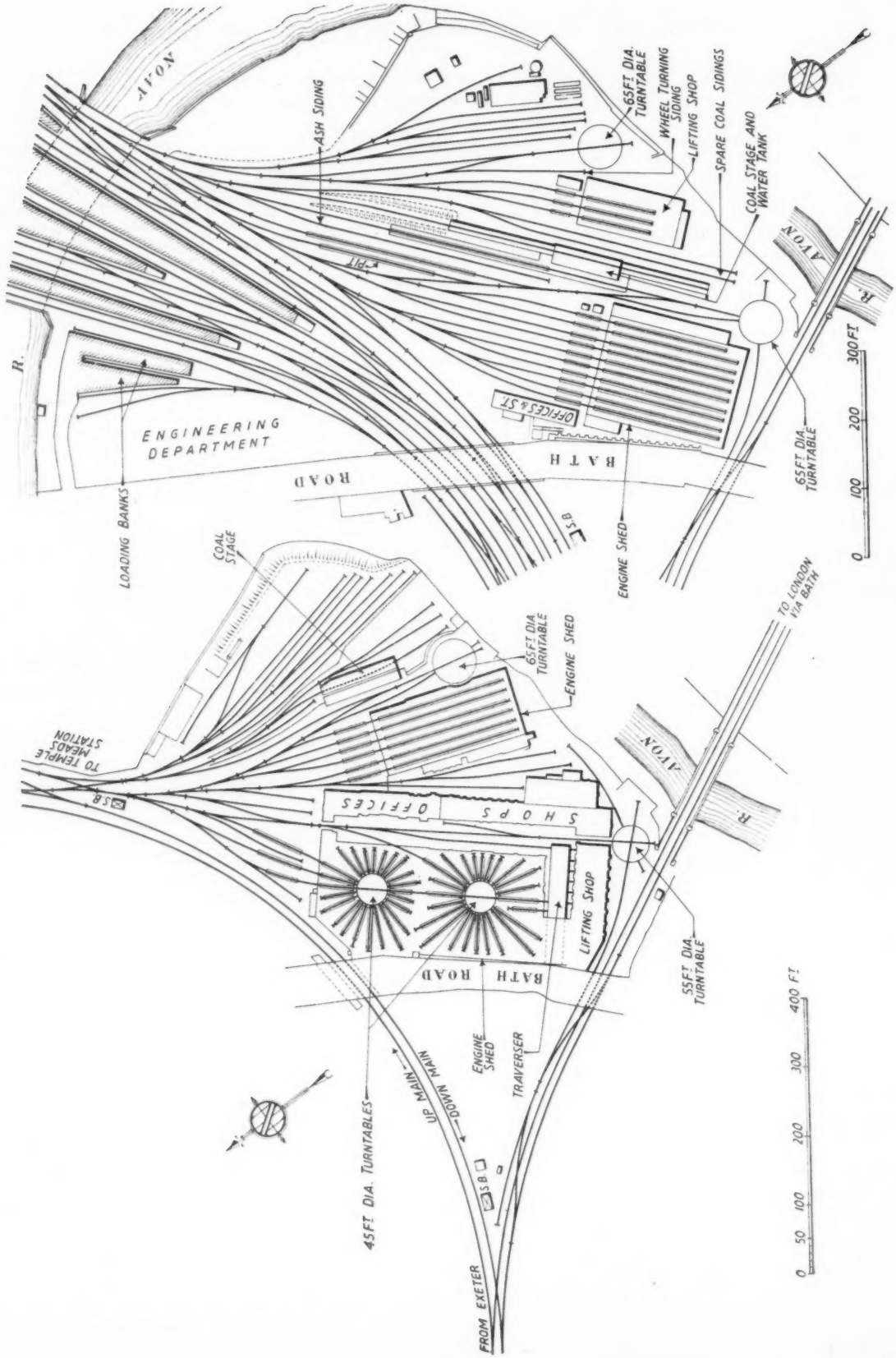
THE proposal of Mr. Pearson before the coming of the underground railways of London for the erection of a central station into which the trains of every railway company should run, has its modern counterpart in M. Ferdinand Bjerke's scheme for the railways in Oslo. For some time past various proposals have been considered for the reorganisation of local and long-distance passenger traffic at Oslo, the majority of which have in common the provision of a single central station in place of the several terminal points now existing. The main-line terminals of Oslo are two in number, being the East station, which deals with traffic from Trondheim, Bergen, Stockholm, Denmark and South Sweden, and the West station, dealing with traffic from Drammen and South Norway (and, in the near future, Stavanger). Both stations have to cope with a fair amount of local traffic in addition. There are also several light railways or tramways, terminating at various points in the town, that connect outlying districts—Ekeberg, Östensjo, Baerum, Holmenkollen, &c.—with the centre of the city. M. Bjerke's proposal is that the whole of this traffic should converge into one station and he has chosen the site of the present East station as being the most suitable for this purpose. It should be noted at this point that there is in Oslo very little interchange traffic between the long-distance lines, but it is felt that the provision of a central station for all classes of rail traffic will be a convenience to residents in the city and suburbs, as well as a logical proposition that should afford appreciable economies in operation. A corollary to this proposal is the abandonment of the West station.

M. Bjerke draws a line of demarcation between the local and long-distance traffic, and has treated these as separate problems, drawing up separate plans for each. To bring the traffic from the Drammen and South Norway lines, now using the West station, into the new central station M. Bjerke proposes that a new line should be built from Sandvika, on the Drammen line, to Grefsen on the Bergen line, avoiding the city of Oslo. This line would be used by the long-distance trains only. The line from Sandvika to Oslo West would not be entirely abandoned but would be retained as far as a point just outside the West station for the use of local traffic which would there branch off into a new tunnel under the city to link up with the existing Holmenkollen tunnel at its present terminus near the National Theatre. Thence the line would continue under the city to the East station which would be reconstructed on the most modern lines as the new Central station. The local traffic from Trondheim and the Denmark lines would diverge from the main lines outside the East station and run into the new tunnel. It would thus be possible to arrange for balanced local workings to and from the east and west lines and the Holmenkollen line. Linked up with this scheme is M. Bjerke's proposal to shorten the rail distance between Oslo and Bergen by the construction of a line from Hönefoss to join the proposed Sandvika-Grefsen loop at Jar. Although this would reduce the distance by only about 26 miles, it is estimated that an hour would be saved on the journey via Hakadal and Roe, because the long and steep gradients on that line would be avoided. M. Bjerke adds the further proposal to bore a new tunnel at Bergen beneath the Flören mountain, so as to avoid the present long railway detour round it and save 18 miles more.



Existing and proposed new lines serving Oslo

WEED KILLING BY HAND.—In our issue of July 23 we described the weed-killing train recently introduced on the Southern Railway. This train is proving most effective, but there are certain spots which it cannot reach. For destroying weeds in such places a special railway powder for hand dusting the weeds is prepared and put up in duster tins by the Atlas Preservative Co. Ltd., the preparation being known as Atlacide. It is non-poisonous, and a number of duster tins can be carried attached to the belt of a permanent way lengthman. The effects are not apparent until 10 or 15 days after application as the chemical does not get down to the roots in a shorter period, and this is absolutely necessary for the total destruction of the weeds.



Layout plans of old (right) and new (left) locomotive depot at Bath Road, Bristol, G.W.R.

AN UP-TO-DATE LOCOMOTIVE DEPOT

Reconstruction of Bristol, Bath Road, locomotive depot, Great Western Railway, was an important part of a general scheme of reconstruction at Bristol

IN 1933, under the Development (Loan Guarantees and Grants) Act of 1929, the Great Western Railway put in hand the reconstruction and enlargement of Temple Meads station, Bristol, which was described in our Special Number dated December 8, 1933. The work included the remodelling of the locomotive running sheds and shops adjacent to Bath Road. The old engine sheds were built in the time of the Bristol & Exeter Railway and as a consequence were designed for the accommodation of broad gauge engines. One of the sheds was of the turntable two-unit type 330 ft. long by 154 ft. wide equipped with two 45 ft. turntables, 24 roads radiated from one and 23 roads from the other. The other shed was straight, 209 ft. long by 95 ft. wide with six roads, each equipped with an engine pit 190 ft. in length. The erecting, machine and smith's shops and the Locomotive Superintendent's office together with the stores, were located between the two sheds, and there was a coal stage in the locomotive yard adjacent to the straight shed which had one single and two double tips, a 42,400 gallon water tank being mounted above it. A turntable 55 ft. in diameter was provided in the yard.

General view of approach lines to Bath Road depot, Bristol; engine sheds on right; coaling stage, centre; lifting shop on left

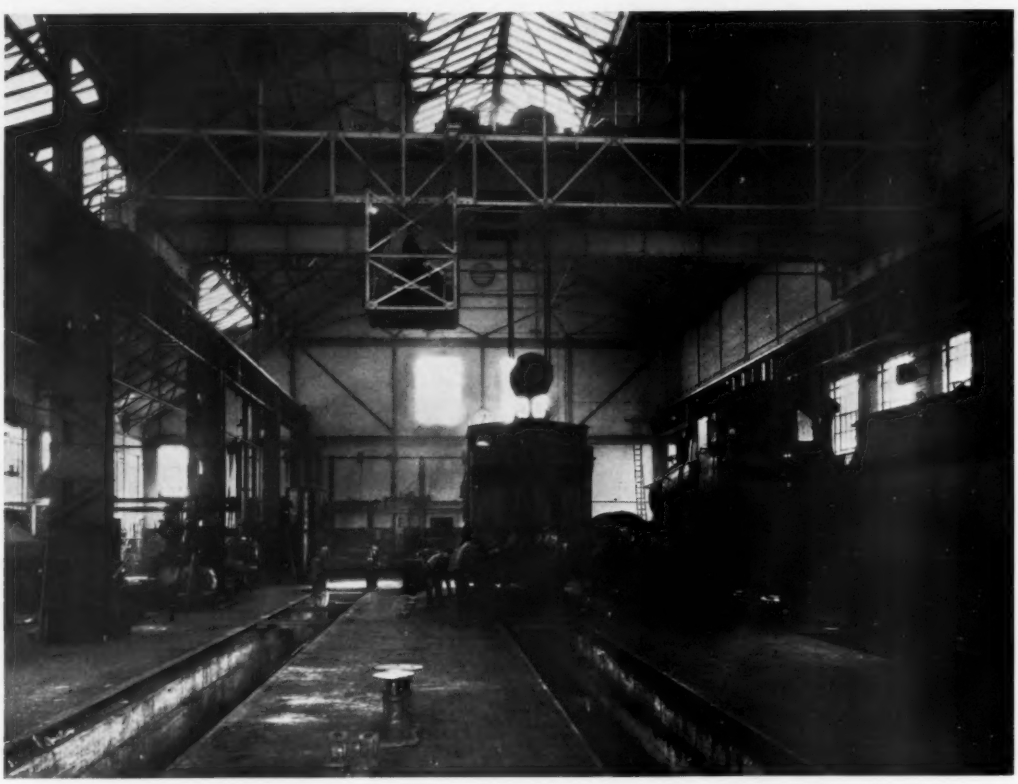
Owing to the fact that the turntables in the sheds were only 45 ft. diameter, it was impossible to use the sheds for any engine larger than those of the standard goods type, and consequently all large engines were stabled at the straight road shed, a practice which gave rise to congestion and difficulties in working. Moreover, as the straight road shed was separate from those fitted with the turntables, division of the staff occurred, and unremunerative time resulted. In the old layout, engines coming from the main line to the shed dropped their fires on the road leading to the coal stage, and the engines after being coaled and turned, were shunted back to the pits in front of the shed where the ashpans and fireboxes were cleaned. As there was no ash siding, the ashes soon accumulated in front of the shed and caused much inconvenience; also when moving coal wagons, or two or more engines were coupled together in front of the shed, it was necessary to occupy the main line with permission from the signal box, and this caused considerable delays in working.

The 55-ft. diameter turntable mentioned above gave access to the relief line and so could not be used by the larger engines, and another difficulty arose from the fact that the clearances of the old coal stage were not sufficient for the modern locomotive tenders. The old lifting shop was too narrow to accommodate larger engines, and access to the shop was very slow because a hand propelled traversing table had to be used.

Advantages of the New Layout

The new layout of the locomotive depot allows greater freedom of internal working and marshalling of engines. Locomotives coming from the main line can now clean their fires at the dropping pits before coaling or at the two extra pits provided. There is also an ash siding to accommodate ash wagons. The ingoing and outgoing roads are now separate and additional outlets from the shed roads are provided. The 55 ft. diameter turntable has

Entrance to the engine sheds



Interior of lifting shop, Bath Road locomotive depot, Bristol, G.W.R.

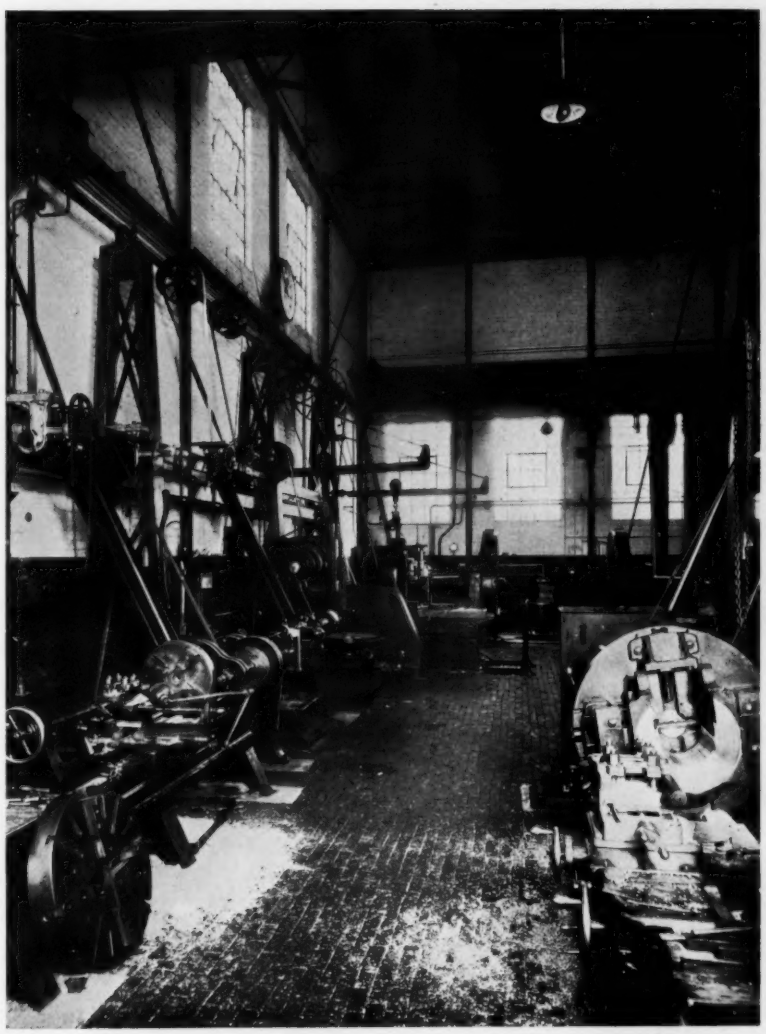
AN UP-TO-DATE LOCOMOTIVE DEPOT

been replaced by one of 65 ft. diameter which allows larger engines to enter or leave from the relief line. The new coal stage with its increased clearances enables all classes of engines to be coaled without difficulty.

In the new layout a straight road shed of what is now the standard type is provided. This is 212 ft. long by 157 ft. wide and contains ten roads having pits 196 ft. long, whilst ten further pits 40 ft. long are available outside the shed. Compressed air is laid on at suitable points and the shed is equipped with a hot water boiler washing plant which receives its steam from two loco-type boilers, the steam from which is also used for heating the offices and lifting shop. Two of the latest pattern sand driers, fitted with small modern driers are located one outside the shed and one inside the shed; each of them is capable of drying 3½ tons of sand daily.

The coal stage measures 103 ft. long by 27 ft. wide and has three coaling tips, above which is mounted a tank having a capacity of 131,500 gallons of water for locomotive purposes. Two turntables, each 65 ft. diameter, now serve the depot.

On the site of the old straight engine shed a new lifting shop measuring 145 ft. long by 70 ft. wide has been erected. This has three roads with pits 100 ft. long. It is equipped with a 50-ton electric overhead crane supplied by Cowans Sheldon & Co. Ltd., Carlisle. This appliance is fitted with an auxiliary crane for dealing with small articles up to 10 tons weight. The 50-ton loads can be lifted at 4 ft. per min. and the 10-ton loads at 20 ft. per min., the travelling speed of the crane being 200-ft. per min. and the traversing speed 75 ft. per min.



Machine section of lifting shop

As the photographic illustrations show, a number of machine tools and appliances are accommodated at one end of the shop. These include wheel lathes, planing and slotting machines, other lathes of various sizes, a sensitive drill, and a screwing and tapping machine, in addition to radial drills and a tool grinder with grindstone. The air compressor has a capacity of 250 cu. ft. per min. at a pressure of 100 lb. per sq. in. All the machines are driven by electric motors and they have one double smith's hearth with electric blowers, also a coppersmith's hearth with electric blower, a coppersmith's and tinsmith's bench with gas heating and a whitemetaller's bench with gas heated white metal pots. A cleaning bosh is included in the installation and one corner of the building is partitioned off for the carpenters, and here also is a plant for manufacturing firelighters. This section also contains a circular saw. A ground wheel lathe is outside the shop on a special road. At the Bath Road sheds the engine power comprises 82 locomotives, including 25 4-6-0 express passenger locomotives. In addition, the neighbouring shed at St. Philip's Marsh accommodates 121 locomotives, mainly of goods and mixed traffic classes.

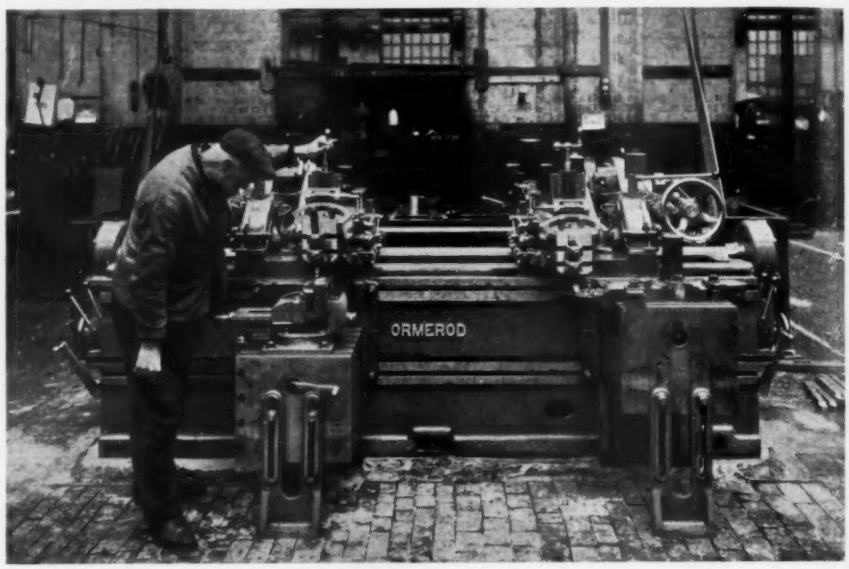
The new facilities thus afforded have greatly expedited and facilitated the movements of engines to and from the shed, and have similarly led to economy in the time spent in handling them during coaling, watering, ash dumping and other operations, whilst improvements in connection with light repairs and maintenance in the lifting shop and shed have also been effected.

NEW STYLE TICKETS IN SWITZERLAND.—The Swiss Federal Railways are adopting a new style of ticket printing which, while retaining the previous clear distinction between singles and returns, avoids the risk of frequent punching rendering the text of single tickets illegible. This difficulty was often experienced when singles were printed with the letterpress parallel with the longer dimension, to distinguish them from returns. Now, both types are being printed with the text reading across the shorter dimension, but returns are clearly differentiated by bearing the words " et retour " in white on a black ground, immediately below the station of destination. The new tickets are to be issued gradually, the returns first as necessary. The new singles will be issued as soon as the whole stock of old type returns has been exhausted.

NEW MACHINE TOOLS IN CREWE WORKS, L.M.S.R.

Ormerod double-headed shaper

AMONG the new machine tools recently installed at the Crewe works of the London Midland & Scottish Railway, is an Ormerod 16-in. stroke double-head traversing shaping machine. This is a heavy duty tool specially designed for locomotive work. It has independent quick power traverses to the saddles and a tool relieving device. High-speed steel 18 per cent. tungsten tools are at present in use, but tests are being carried out at Crewe with tungsten-carbide tools, the tool holders being of the planer type. The tool relieving device prevents drag on the return stroke. The machine is used at Crewe for dealing with various locomotive components such as cast steel crossheads, crosshead arms, reversing links and other parts. In the photograph, the left-hand head is shown operating on a valve spindle guide with white metal surface at a speed of 93 ft. per min. with a cut of $\frac{1}{16}$ in. and feed of $\frac{1}{16}$ in. The right-hand head is operated on a reversing link giving one roughing cut ($\frac{1}{4}$ in. depth of cut) with $\frac{1}{32}$ in. feed at a speed of 60 ft. per min., and finishing at 60 ft. per min. with $\frac{1}{32}$ in. feed and cut of 0·011 in.



Ormerod shaper in Crewe locomotive works

The bed of the machine is a heavy box section casting, 10 ft. long, and carries two tables and two headstocks. The tables have tee slots machine cut from the solid in the top and vertical faces, and are detachable from their aprons. Horizontal adjustment to the tables is by hand through rack and wheel, and vertical adjustment through screw and bevel gearing, fitted with ball thrust washers. Outer support brackets are fitted to the tables. Each headstock is independently driven through a 9-speed gearbox and motor ; the motors are coupled direct through vee ropes and friction clutches to the gearboxes. The headstocks have six rates of self-acting feed. The tool heads are of steel throughout and fitted with worm and quadrant type clapper boxes for machining internal curves. Self-acting vertical feed is fitted to each tool head, and this is actuated by friction quadrant on the rams, which are self-aligning to the length of stroke, and the position of the ram. The feed may be easily and quickly varied, and engaged or disengaged.

The tool relieving device already referred to, which is arranged internally, operates in any vertical or angular position of the toolbox. It is quite independent of the self-acting feed, and may be operated simultaneously. It is positive in action, readily engaged or disengaged, and requires only ordinary tool clearance to operate.

The Opening Up of Iran (Persia)

A proposal for a line across Persia was made in the 60's by de Lesseps, the builder of the Suez Canal, his intention being to take it through Asia Minor, Mesopotamia (Baghdad) and Southern Persia to India. Rivalry between England and Russia is said to have prevented this scheme from maturing, but just before the war another project was put forward by an international concern, backed principally by Russia, for a line from Tiflis, through Tahriz, Teheran, and Isfahan to the Baluchistan border, with a branch to the Persian Gulf. After the war England expressed a wish to see the Mesopotamian lines connected with the Persian capital and Baku, on the Caspian Sea. Although there were some who declared that a system of roads would meet all the transport requirements of the country, the Iranian (Persian) Government adopted the view that certain main lines were essential, but nevertheless took steps to construct considerable lengths of motor roads to replace the original caravan routes, and about 12,000 km. (7,456 miles) of these have now been built. They are usually 8 m. (26¼ ft.) wide, but here and there widths of 10 m. (32·8 ft.) or even 12 m. (39·4 ft.) are to be found. Some difficulty has been experienced due to scarcity of materials, but in 1934 the first cement works in Iran was opened at Teheran. The road from the capital to the Caspian Sea, 218 km. (135·6 miles), when first built, crossed the Elburr range at an altitude of 3,000 m. (10,042 ft.), but to counteract difficulties caused by snow a tunnel 1,900 m. (2,078 yd.) long, at an altitude of 2,700 m. (8,858 ft.) was subsequently made by Belgian and Swiss engineers. The final decision to construct a railway system was taken in 1923, and work began about 5 years later. In our issue of July 26, 1935, we published particulars, with map, gradient profile, and illustrations, of the Trans-Iranian portion of the Iranian (Persian) State Railways, the first line undertaken; work on it is being energetically pushed forward, and we published a further article descriptive of this great work on June 11, last.

West Side Improvements, New York, New York Central Railroad

(*See Overseas paragraph and map on page* 231)

Right: Some of the tracks completed in the $1\frac{3}{4}$*-mile section, partly built in an open cutting through granite, between Thirtieth Street yard and Sixtieth Street yard. The warehouse has been underpinned for the passage of the new lines*

A section of cutting involving the excavation of some 25 ft. of solid rock

Bird's-eye view of new cutting in densely built area

General view of the Villeneuve-St. Georges accident, P.L.M. Railway. The engine is lying on its side, in the fork of the junction between the Melun and Corbeil lines, with a second class steel coach resting almost broadside against the tender. The 6-wheeled van in the foreground, the first vehicle in the train, broke away from the tender and was pushed forward and wrecked by the heavy steel postal van behind it. The remains of the wooden third class coach in which most of the casualties occurred can be seen just behind the second class coach, a view of the other side of which accompanies the article on page 250. The rest of the train has been pulled back and away from the scene of the accident

RAILWAY NEWS SECTION

PERSONAL

G.W.R. Appointments

The following appointments are announced by the Great Western Railway:—

Mr. K. J. Cook, Assistant Loco. Works Manager, Swindon, to be Manager, Loco. Works, Swindon, in succession to the late Mr. R. A. G. Hannington, whose death was recorded in our issue of July 23.

Mr. H. Randle, Assistant to Carriage and Wagon Works Manager, Swindon, to be Assistant Loco. Works Manager, Swindon.

Mr. C. H. Whitelegge, General Assistant and Parliamentary Agent, Solicitor's Department, Paddington, to be Assistant Solicitor and Parliamentary Agent, Paddington.

Lt.-Col. J. A. Polwhele, O.B.E., V.D., M.Inst.C.E., late Manager and Engineer-in-Chief of the Bengal-Dooars Railway, whose death we announced in our issue of May 28, left estate valued at £8,029 (£4,822 net).

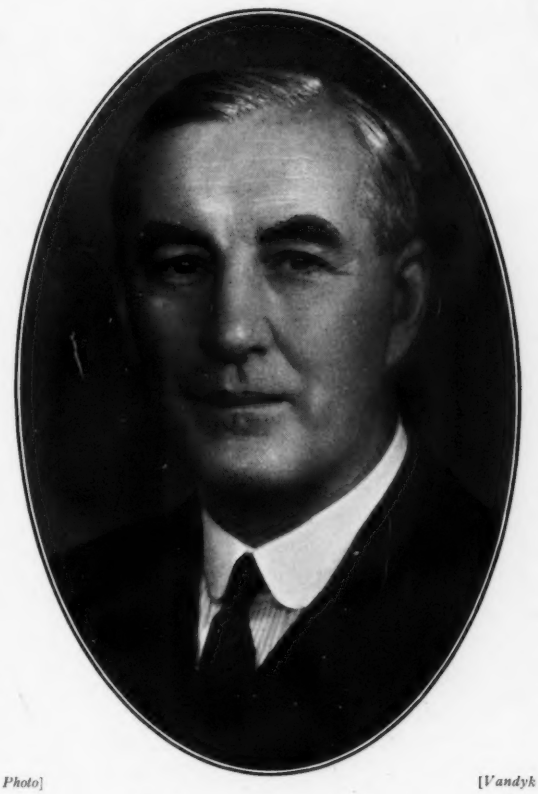
Mr. Stanley Norman Loosen, Works Manager of the Coronium Metal Company, of Reading, has, it is announced by the Anti-Attrition Metal Company's directorate, been appointed a member of the board.

Mr. C. A. Proctor and Mr. J. L. Collyer have been appointed Managing Director (Commercial) and Managing Director (Manufacturing) respectively of the Dunlop Rubber Company Limited, in succession to Sir George Beharrell, the new Chairman. Mr. Proctor has hitherto been Overseas Director, and Mr. Collyer Director of Manufacture.

Sir Montagu Sharpe, K.C., Chairman of the Egyptian Delta Light Railways Limited, speaking at the 40th general meeting of that company in London on July 23, referred with the deepest regret to the great losses sustained during the past year by the deaths of Mr. Walter Home, C.I.E., on October 6, 1936, and of H.E. Sir Ismail Sirry Pasha, on January 21, 1937. Mr. Home had been a Director for 25 years and his extensive railway experience was always placed freely at the disposal of that company. Through his death they had lost a very valued colleague and friend.

Mr. Home's death was recorded in our issue of October 9, 1936, in which was also a brief outline of his career.

Mr. Leonard Browett, C.B.E., whose appointment as Secretary to the Ministry of Transport we recorded in our issue of June 25, was born in 1884 and educated at King Edward's School, Birmingham. He entered the Inland Revenue Department in 1904 as Assistant Surveyor and Surveyor of Taxes, and in 1910 transferred to the Secretaries' Office, Inland Revenue. From 1917-1919 Mr. Browett was Deputy Director, and later Director, of Ship Requisitioning, Ministry of Transport; and British Representative and Chairman of Tonnage Committee, Allied Maritime Transport Council. Appointed Assistant Secretary, Inland Revenue, in 1919, he remained in that post until 1930, and in 1932 became Principal Assistant Secretary to the Board of Trade. From 1935 Mr. Browett was Deputy to the Chief Industrial Adviser to H.M. Government, and in May, 1937, was appointed Second Secretary to the Board of Trade.



[Photo] [Vandyk

Mr. Leonard Browett, C.B.E.

Appointed Secretary to the Ministry of Transport

Mr. C. R. Ellis, District Traffic Superintendent, Tucuman, Central Argentine Railway, has been appointed Outdoor Assistant to the Traffic Manager, with headquarters at Buenos Aires, *vice* Mr. Harold Boam, who has retired on pension.

Indian Railway Staff Changes

Mr. J. A. Morris has been appointed to officiate as Deputy Chief Mechanical Engineer, E.I.R., as from May 14.

Mr. E. R. Fleeton has been appointed to officiate as Deputy Agent, Organisation, E.I.R., as from May 15.

Mr. H. N. Parker, Officiating Deputy Traffic Manager, E.B.R., has been granted 6½ months' leave as from June 3.

Dr. J. Cairns, C.I.E., O.B.E., Chief Medical and Health Officer, N.W.R., has been granted four months' leave as from May 28.

Mr. C. A. Crawford has been confirmed as Deputy Chief Commercial Manager, E.I.R.

Dr. E. Haworth, M.R.C.S., L.R.C.P., D.T. & H., has been appointed to officiate as Chief Medical and Health Officer, N.W.R., as from May 28.

Mr. P. D. Low has been appointed to officiate as Deputy Chief Mechanical Engineer (Electrical), E.I.R., as from June 7.

Mr. R. V. Hitchcock, Deputy Chief Engineer (Maintenance), G.I.P.R., has been granted two years' leave preparatory to retirement, as from May 11.

Mr. J. N. E. Nagle has been appointed to officiate as Deputy Traffic Manager, E.B.R., as from June 4.

The late Mr. E. E. Sawyer, a former Director of the Madras & Southern Mahratta and West of India Portuguese Railways, whose death on April 11 was reported in our issue of April 23, left estate valued at £10,591 (£10,423 net).

Mr. F. Woodhead, formerly a principal of Jonas Woodhead & Sons Ltd., spring and axle manufacturers, left estate valued at £108,687 (£89,242 net).

Mr. Frank P. Oliver, Secretary of the local boards of the Buenos Ayres Great Southern and Buenos Ayres Western Railways, retired from that position on June 30, after 32 years' service with the latter company, and has been succeeded by Mr. F. E. A. Rowell, Assistant Secretary. Mr.

Mr. F. P. Oliver

Secretary, local boards, Buenos Ayres Great Southern and B.A. Western Railways 1936-37

Oliver, who was born in Kent, entered the service of the B.A. Western Railway in 1905, having been previously for 10 years with the Central Argentine Railway, where he successively occupied positions in the Traffic Department, management and Local Committee. In 1906 he was appointed Chief Clerk of the B.A. Western Railway, and in 1923 became Assistant Secretary to the local board. In 1931 he was promoted to be Secretary, and in January, 1936, as the result of the introduction of the system of unified working between the Southern and Western Railways, he became Secretary of the local boards of both companies.

Mr. Frank E. A. Rowell, who succeeds Mr. Oliver as Secretary of the local boards of the B.A. Great Southern and B.A. Western Railways, was born in Newcastle-on-Tyne, and entered the service of the B.A.G.S.R. in 1910, as a clerk in the local board office. In 1919 he was promoted to be Chief Clerk, occupying this position until 1934, when, owing to the illness of the late Mr. G. R. Darbyshire, he was appointed Acting Secretary of the local board of the Southern Railway. In 1936 he became Assistant Secretary of the local boards of both the Southern and Western Railways. Mr. Rowell is the inventor of the code in use by the Southern and Western Railways, and other organisations of the River Plate House group, which is recognised as being one of the most economic in operation in Argentina. A noted athlete in his younger days, he has gained numerous championship honours in both running and lawn tennis.

Mr. F. E. A. Rowell

Appointed Secretary, local boards, Buenos Ayres Great Southern and B.A. Western Railways

Mr. J. W. Watkins, whose appointment as Assistant Divisional Superintendent of Operation, Derby, L.M.S.R., we recorded in our issue of July 9, entered the service of the former Midland Railway on April 1, 1905, as Junior Clerk at Ashchurch, and served at several stations until he joined the ranks of the Gloucestershire Regiment on August 31, 1914. He subsequently received a commission in the field and was posted to the 2nd Battalion Lancashire Fusiliers, serving with that regiment until May, 1918, and rising to the rank of Lieutenant-Colonel in command of the battalion. He was awarded the D.S.O. and M.C. and was mentioned in despatches four times. He was wounded in May, 1918, and, after recovering, served in England until leaving the Army with the rank of Lieut.-Col. in July, 1919. Upon his return from the Army service Mr. Watkins was posted to the headquarters staff of the former Midland Railway, dealing particularly with staff matters, and continued in the same position under the grouping. In 1926 he was appointed Assistant (Outdoor Section) Chief General Superintendent's Office, and in January, 1932, he was appointed Assistant Divisional Superintendent of Operation, Derby. In June, 1935, consequent upon the merging of the traffic and motive power responsibilities under the Divisional Superintendent of Operation, his designation was changed to Assistant Divisional Superintendent of Operation (Traffic). Mr. Watkins is a member of the Institute of Transport.

Mr. J. W. Watkins, M.C.

Appointed Assistant Divisional Superintendent of Operation, Derby, L.M.S.R.

Mr. W. R. J. Murray, M.Inst.C.E., who has been appointed to succeed the late Mr. J. A. Trench as Stores Superintendent of the B.A. Great Southern

Mr. W. R. J. Murray

Appointed Stores Superintendent, Buenos Ayres Great Southern and B. A. Western Railways

Mr. T. E. Maloney

Appointed General Manager, Southern Division, Queensland Government Railways

and B.A. Western Railways, began his engineering career by taking the engineering course at the Heriot Watt College, Edinburgh, and afterwards served his apprenticeship in the Chief Engineer's Department of the Caledonian Railway under the late Mr. Donald A. Matheson, M.Inst.C.E. Thereafter he was employed for two years as contractor's engineer on two sections of the Glasgow Main Drainage South Side Scheme, until, in 1908, he joined the Buenos Ayres Great Southern Railway as an Assistant Engineer. Three years later he took charge of various new extensions, and was District Engineer on the Dolores, and afterwards on the Home District. He then acted for two years as Engineer in charge of the Rio Negro irrigation works, carried out by the railway company on behalf of the Argentine Government. In 1925 he was appointed Maintenance Engineer. Except for a period of three years, during which he was in charge of new extensions, he has occupied this position until his appointment as Stores Superintendent. Mr. Murray is a Member of the Institution of Civil Engineers, and Vice-President of the Buenos Aires Association of the Institution.

Mr. T. E. Maloney has been appointed to succeed Mr. W. A. Hooper, who has recently retired from the position of General Manager of the Southern Division of the Queensland Government Railways. Mr. Maloney, who is 52 years of age, joined the Queensland Railway service in 1899 as a lad porter. Twelve months later he was appointed to the clerical staff, and after obtaining experience in various parcels, ticket and goods offices, was transferred, in 1909, to the office of the District Traffic Manager, Brisbane. Four years later he was promoted to the position of Chief Trains Clerk in that office, which post he held until 1921, when he was transferred to the Commissioner's Office as Officer-in-Charge of Timetables. In 1925 he was given the additional status of Commissioner's Inspector and held these dual positions until his present appointment.

Burma Staff Announcements

Direction

Mr. E. Procter, Statistical and Organisation Officer, has been promoted to officiate as Deputy Railway Commissioner and Secretary to the Railway Board, as from July 15, in place of Mr. C. P. Brewitt, on combined leave of 7½ months.

Mr. W. J. Air, District Engineer, has been promoted to officiate as Statistical and Organisation Officer, as from July 15, in place of Mr. Procter.

Engineering Department

Mr. G. G. T. Toller, Deputy Chief Engineer, has been promoted to officiate as Chief Engineer, as from July 23, in place of Mr. J. H. Rickie, granted leave of 21 months preparatory to retirement.

Mr. J. M. G. Doog has been promoted to officiate as Deputy Chief Engineer, as from July 23, in place of Mr. Toller.

The designation "Superintendent of Telegraphs" has been changed to "Telegraph Engineer" as from July 6.

Traffic Department

Mr. E. A. Sims, District Traffic Superintendent, Indian State Railway Service, has been appointed to officiate as Traffic Manager, with effect from June 5, in place of Mr. G. S. Darby, on leave for 24 months preparatory to retirement from March 25 last.

Locomotive Department

Mr. N. Johnson, Deputy Carriage and Wagon Superintendent, has been promoted to officiate as Locomotive and Carriage Superintendent, as from July 1, in place of Mr. G. Thomson, granted leave for 6 months preparatory to retirement.

Mr. E. V. M. Powell has been promoted to officiate as Deputy Carriage and Wagon Superintendent, as from July 1, in place of Mr. Johnson.

Stores Department

Mr. C. B. Hayes has been confirmed as Superintendent of Stores, as from May 16.

Accounts Department

Mr. W. H. Chance: Designation changed from "Chief Accounts Officer" to "Controller of Railway Accounts," with effect from April 6, 1937.

Mr. T. C. Parker: Designation changed from "Deputy Chief Accounts Officer" to "Deputy Controller of Railway Accounts."

Audit Department

Mr. A. R. Rebello: Designation changed from "Chief Auditor, Burma Railways," to "Chief Auditor, Railway Accounts," as from June 4.

L.N.E.R. Appointments

The L.N.E.R. announces the following appointments:—

Mr. A. H. Peppercorn, Assistant Mechanical Engineer, Stratford (acting Locomotive Running Superintendent, Southern Area), to be Locomotive Running Superintendent, Southern Area, in succession to Mr. I. S. W. Groom, who resigned from the service on July 31.

Mr. F. W. Carr, Works Manager, Gorton (acting Assistant Mechanical Engineer, Stratford), to be Assistant Mechanical Engineer, Stratford, in succession to Mr. Peppercorn.

Mr. J. S. Jones, Assistant to the Locomotive Works Manager, Doncaster (acting Works Manager, Gorton), to be Works Manager, Gorton, in succession to Mr. Carr.

Mr. K. S. Robertson, Carriage & Wagon Works Manager, Stratford, to be Assistant Mechanical Engineer, Gorton and Dukinfield.

Mr. H. C. L. Edwards, Assistant Manager, Carriage Shops, Stratford (acting Assistant to the Locomotive Works Manager, Doncaster), to be Carriage & Wagon Works Manager, Stratford, in succession to Mr. Robertson.

Mr. D. R. Edge, Carriage & Wagon Works Manager, Doncaster, to be Assistant to the Chief Mechanical Engineer, in succession to Mr. O. V. P. Bulleid who has accepted a position with the Southern Railway.

Mr. M. Weeks, Assistant to the Carriage & Wagon Works Manager, Doncaster, to be Carriage & Wagon Works Manager, Doncaster, in succession to Mr. Edge.

Sir Stephenson Hamilton Kent, K.C.B., and Mr. Allan Macbeth have been elected Directors of Guest, Keen & Nettlefolds Limited.

B.E.N. Patents Limited announces that Mr. R. J. Pettitt has been appointed a Director of the company. Mr. Pettitt joined the firm in 1927, and had previously been Sales Manager of R. Cadisch & Sons. Altogether, he has been connected with the motor trade for the past 25 years.

We regret to record the death in Berlin last week of Herr Werner von Siemens, at the age of 52. He was a Director of the well-known pioneer German electrical firm of Siemens und Halske, and was a grandson of its founder.

It is announced that Sr. Augusto Krause Arnim, Sub-Manager of the Argentine State Railways, has been reappointed to that position, having withdrawn at the request of the Minister of Public Works the notice of resignation which we recorded in our issue of May 21.

We learn with regret of the death on July 8, at the age of 87, of Herr Carl Christensen, who was for some years Manager of the Lübeck Büchen Railway, retiring in 1921. After the Franco-Prussian war he was engaged in railway work in Alsace Lorraine, and entered the service of the Lübeck company in 1885. During the Great War he was appointed to supervise special military transport services for which he received official recognition.

We have learned with regret of the recent death of Mr. G. F. Tyas, who was born in Leeds and served his time at the Airedale foundry of Kitson & Company. Mr. Tyas came to London and assisted in the design of a number of narrow-gauge locomotives for various overseas railways. Although for 32 years Mr. Tyas was a member of the engineering staff of the Metropolitan Water Board, he never allowed his enthusiasm for light locomotives to wane, and he assisted in laying out the narrow gauge railway at Hampton pumping stations, and was responsible for designing the locomotives used on it. He was both an enthusiast and an authority on steam tramway history, and on a number of occasions contributed to the technical press on this subject.

MINISTRY OF TRANSPORT ACCIDENT REPORT

Battersea Park, S.R., April 2, 1937

At about 8.2 a.m. the 7.31 a.m. electric train, Coulsdon North to Victoria, ran into the rear of the 7.30 a.m. electric train, London Bridge to Victoria via Tulse Hill, standing at the up local line home signal, which had been pulled off a moment before. Speed at the moment of impact was estimated at 30 to 35 m.p.h. Both trains consisted of 2 3-coach motor sets with 2 trailers between. The rear motor coach of the standing train was telescoped and the guard sustained fatal injuries. Six passengers were killed and 3 fatally injured. Two passengers were employees, one travelling on duty; 7 passengers were seriously injured and 10 taken to hospital, as well as the motorman and guard of the Coulsdon train, while 62 passengers complained of minor injuries and shock. Power was removed from the local lines conductor rails at once and there was no fire.

The driver of the 8.0 a.m. Victoria to Brighton train was stopped by hand signal on the down main, which was obstructed, and used his short-circuiting bar; the up main was cut off from the sub-station. Relief work was efficiently carried out, and the emergency traffic arrangements made were very creditable. Visibility was poor, with drizzling rain. Lt.-Col. A. H. L. Mount, assisted by Major G. R. S. Wilson, conducted the inquiry. The accompanying diagram explains the circumstances of the accident.

Manual signalling is in use here. Pouparts Junction signalbox is of the ordinary type, but Battersea Park box, with those north as far as Victoria is electro-mechanical, the points being operated by full sized levers—14 working and 9 spare—and the motor operated semaphores by small slide handles—32 working and 19 spare—arranged over the large levers, above the bell key front board. In addition to the bell signals, trains are described on Walker type transmitters and receivers. The block apparatus is Sykes lock-and-block (Central Section pattern), and a special modified miniature construction is used to work in conjunction with the signal slides. This, except the block plungers and switch-hooks, is contained in a box casing, the front of which is removable in panels. The plungers are below the slides on the bell front board, and their contacts, which release the adjacent signal boxes, are not exposed when the panels are removed. Cancelling is effected by means of buttons, necessitating the co-operation of the adjacent signalman northwards, but not southwards; the respective buttons then acting are used by the Battersea Park signalman alone, Pouparts Junction or Wandsworth Road (South London Line) not being obliged to co-operate.

The button cancelling apparatus applies to the resetting of the "train on" indicators, the release of backlocks and intermediate front locks. The buttons themselves are on the slide mechanism casing. The "plunge when free" arrangement is not applied to the up local home and starting signals, although the block clearance point is beyond the latter. It is therefore the custom, though there is no instruction to this effect, to turn the up local switch hook immediately after plunging, or on receipt of "train entering section," to prevent the lowering of the electric semaphore block indicator at Pouparts Junction before Battersea Park can give "train out of section." There is a "train waiting" treadle 130 yd. in rear of the up local home, ringing a bell, as long as it is operated by a wheel, in Battersea Park box. The following instruction, dated June, 1932, was in force, but has since been withdrawn:—

> In the event of the special cancelling apparatus failing, the Signalman must break the seal of the instrument case and move the slides in order to restore the instrument and lever to the normal position, immediately calling the Linesman to put the instrument in order and re-seal the case. The failure must be reported in due course.

Traffic is very heavy and has much increased since the electrification of the lines to Brighton, Worthing and Eastbourne; the number of trains signalled daily in 1932 was 712 and is now 838, an increase of 17¾ per cent. in five years. The bell, Sykes block, and signal slide movements total 972 in the evening peak hour, and there are train describer movements, the setting of the points for South London trains, and possible telephone work. Train booking was discontinued in 1932.

The Course of Events

The other train directly concerned in the causes of the accident was the 7.37 a.m. London Bridge to Victoria via the South London line (this is an up train from Battersea Park to Victoria, but a down train as far as the former point. It is called hereafter the South London train). Its motorman, C. R. Horsefield, and guard, F. W. Kemp, estimated they were held at signal No. 64 (see plan) about 2 minutes, drawing into the station at 8.1 a.m. Neither observed the London Bridge train at signal No. 67. Power failed after they passed Battersea Pier box, but they coasted into Victoria.

J. F. Spiers, motorman of the London Bridge train, judged that he was stopped at No. 67 at about 7.59¼ a.m. and waited about 2 minutes. He was watching the signal; immediately it fell the collision occurred; he had released the brakes but not applied power. Evidence indicates that this signal was off when sighted by the Coulsdon train. No criticism attaches to Spiers, but had he acted a few seconds earlier the collision would have been less serious. Motorman A.

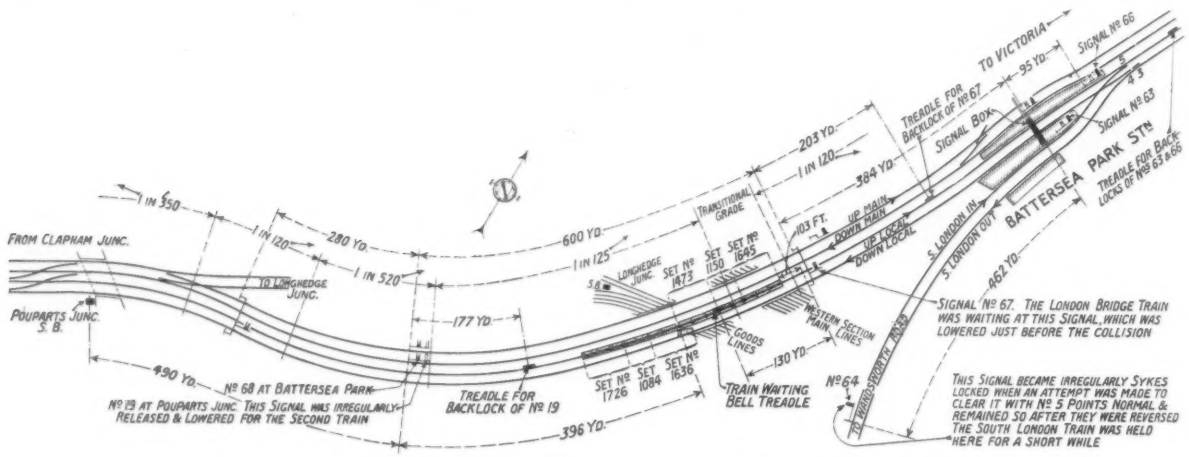

FROM CLAPHAM JUNC.
POUPARTS JUNC. S.B.
TO LONGHEDGE JUNC.
1 IN 350
1 IN 120
280 YD.
1 IN 520
600 YD.
1 IN 125
177 YD.
490 YD.
№ 68 AT BATTERSEA PARK
№ 19 AT POUPARTS JUNC. THIS SIGNAL WAS IRREGULARLY RELEASED & LOWERED FOR THE SECOND TRAIN
TREADLE FOR BACKLOCK OF № 19
396 YD.
LONGHEDGE JUNC.
SET № 1473
SET № 1726
SET № 1084
SET № 1636
SET № 1150
SET № 1645
TRANSITIONAL GRADE
203 YD.
1 IN 120
384 YD.
103 FT.
UP MAIN
DOWN MAIN
UP LOCAL
DOWN LOCAL
GOODS LINES
WESTERN SECTION MAIN LINES
130 YD.
TRAIN WAITING BELL TREADLE
№ 64
TO BRIDGE JUNCTION
TO VICTORIA
SIGNAL № 66
95 YD.
TREADLE FOR BACKLOCK OF № 67
SIGNAL BOX
SIGNAL № 63
BATTERSEA PARK STN
TREADLE FOR BACKLOCKS OF № 63 & 65
S. LONDON IN
S. LONDON OUT
462 YD.
SIGNAL № 67. THE LONDON BRIDGE TRAIN WAS WAITING AT THIS SIGNAL, WHICH WAS LOWERED JUST BEFORE THE COLLISION
THIS SIGNAL BECAME IRREGULARLY SYKES LOCKED WHEN AN ATTEMPT WAS MADE TO CLEAR IT WITH № 5 POINTS NORMAL & REMAINED SO AFTER THEY WERE REVERSED THE SOUTH LONDON TRAIN WAS HELD HERE FOR A SHORT WHILE

Diagram illustrating the circumstances of the accident

Anthony of the Coulsdon train said visibility was hindered by drizzle. Pouparts Junction distant was "on" but he found its other signals "off." He passed the starting signal at about 40 m.p.h. Battersea distant was "on." He then coasted under control, but observed No. 67 "off" as he came round the bend. When he noticed the other train at perhaps "two or three train lengths" he thought it was an empty on the down main. "Almost simultaneously" he realised it was ahead of him and made an emergency brake application. This cannot have been made at a greater distance than 3 coach lengths, say 50 yd. Had he realised the situation when he first saw the train he thought he could have reduced speed considerably. Guard R. W. Adamson generally confirmed this evidence. Signalman C. H. Henrick, Longhedge box (on the low level goods lines) saw the collision and estimated the speed of the Coulsdon train at less than 40 m.p.h. He telephoned for assistance; the Pouparts signalman was much surprised at the news.

The last mentioned was a relief signalman, T. G. P. Hillman, who was a good witness and a keen, alert man. Everything was working satisfactorily until the accident, he said. When the up local block indicator arm fell, apparently behind the London Bridge train, he at once offered the Coulsdon train, which was accepted, and cleared his signals. He received the message for assistance at about 8.7 a.m. and could not understand it. Asking for its repetition, he learned what had happened and himself telephoned for help. Hillman was quite certain that all his duties were correctly carried out and that he received the "out of section" bell signal for the London Bridge train. He had the acceptance bell signal for the Coulsdon train as well as the Sykes release. It would not strike him as very irregular if "out of section" did not accompany the lowering of the indicator, but he would then telephone before offering another train. He thought a stranger was working the Battersea Park box. His starting signal was restored behind the London Bridge train and he had made no use whatever of the cancelling key in his box at that time.

Relief signalman G. F. Childs was on duty at Battersea Park. It was his first day in charge. He had served 14 years in his present capacity and was passed fit to operate 60 boxes. He had had 17 days' training, 7 hours each, in the box, and was found fit to take charge on March 24. His last experience of similar apparatus was 3 weeks in Grosvenor Road box 2 or 3 years earlier. At his examination he was not specifically tested with regard to the operation of the releasing buttons and did not have to use them, but was asked if he was confident in that respect.

The evidence given by Childs to the company's officers and to Colonel Mount was very lengthy but the essential facts maintained by him were that he neglected to set points No. 5 in the right position for the South London train and therefore could not draw slide No. 64, but he could move it far enough to jump the Sykes intermediate lock apparatus to the locked position, so that the slide became irregularly front locked and the signal could not be cleared. He endeavoured to get this lock cancelled with the co-operation of signalman Truelove at Battersea Pier, who said he received the relative bell signal and duly depressed the correct button. He, however, received no bell signal intimating that the release had been obtained, and assumed that, after all, it could not have been wanted. It was not his duty to inquire the reason, nor did he know in what circumstances the release was wanted. He was certain he depressed the up local button.

Childs maintained that he failed to receive the release, but a demonstration he gave after the accident, and other evidence, shows that he made a further mistake himself in pressing the wrong button, so that Truelove's action was ineffective. Time was passing, and Childs, under the wrong impression that the cancelling apparatus was itself out of order decided to open the end panel of the mechanism case and free No. 64 by hand. He did so—first cutting the seals, of course—and at last brought the South London train into the station, whence it departed at 8.1½ a.m. In some way or another, either directly while inserting his arm in the case, or indirectly by his hand coming against the resetting button as he forced the front panel in place again, Childs must have cleared the "train on" indicator for the up local line. The switch-hook also cannot have been over the plunger, because the block indicator fell at Pouparts Junction. Childs could not account for its being off, nor would he admit recollection of having cleared the "train on" indicator or of sending any release to Pouparts Junction, but he did admit that "both these things must have happened." He thought he might have pressed the block plunger inadvertently with his chest, and declared he sent no bell signal to Hillman. He did recollect seeing the switch-hook on the plunger when he pulled No. 67 for the London Bridge train, but could not remember when he turned it. He asserted quite positively "I still think I never made a mistake in any shape or form . . . I say the block bells were never sent."

Signalman F. W. Harvey, 8 years at Battersea Park, gave evidence on the working of the switch-hook, and thought that a supposed treadle failure at 6.5 a.m., which Childs had mentioned, was really an irregularity caused by the latter replacing slides to normal in the wrong order. He could cope with the work at Battersea Park and had never felt the need of a second man, but the removal of the booking lad 4 years ago had resulted in further exertion, as the lad could see the up trains coming and they could be more easily described. He thought a train register might have had preventive effect, with a relief signalman on duty. Traffic had increased one-third since he had been in the box; he had never found it necessary to break the case seals.

Area Inspector G. W. Matcham had been in the area 6 months. He examined Childs in the box on March 24 when the latter operated it correctly for 55 minutes, and gave an explanation of the working of the releases. Matcham thought Childs very smart at his work and one of the last men to lose his head under pressure. He was also of opinion that both Childs and Hillman were involved in the occurrences. Childs, he thought, did not give an "out of section" signal. With the continual ringing Hillman might have got confused as to whether he had had that signal or not. With the arm down—irregularly lowered, as above described—he would have jumped to the conclusion that he had received it and thus offer the Coulsdon train to Childs, who, taken unawares, probably accepted it and must have plunged. With regard to the switch-hook, Childs always used it directly he plunged during the examination on March 24.

Chief Signal Inspector R. Cogger, and Inspector R. J. F. Harland, made tests and confirmed that Childs must have pressed the wrong button when seeking a release for No. 64 slide from Truelove. There was no possibility, either, that a release on one line might have freed Pouparts Junction for another line. A chief lineman and a fitter gave evidence on matters of maintenance. No electrical defects were discovered.

Chief Inspecting Officer's Conclusions

This investigation was rendered difficult by the negative attitude of Childs as to what transpired from 7.57 to 8.1 a.m. The accident resulted from the improper entry of the Coulsdon train into the occupied section under a clear starting signal. No blame attaches to Motorman Anthony or his guard. A false clear failure of the Sykes block instrument at Pouparts Junction may be dismissed, also any irregular use of apparatus by Signalman Hillman. The latter affirmed that Childs transmitted "out of section" for the London Bridge train and accepted the Coulsdon train in the correct manner. Childs denied all this and would not admit the possibility of the acceptance, but he did memorise and stress the fact that the switch-hook was applied when he lowered No. 67 signal. Col. Mount thinks his evidence on this and other matters cannot be relied upon, and, in all the circumstances relating to his previous actions, which culminated in the drastic step of cutting the seals and laying bare the instruments,

a clear and precise account of the facts was hardly to be expected.

Hillman's statement that the Coulsdon train was offered and accepted by bell signal is accepted. The fundamental actions which led to the accident must have emanated from Childs, and, in the circumstances, the receipt or otherwise of the "out of section" bell signal by Hillman is relatively a minor question. Its transmission may seem improbable and it did not require acknowledgment. To accept lowering of the block indicator without the bell is likely, under heavy pressure and, although incorrect, cannot be seriously criticised, provided Childs made, as Hillman was entitled to expect, proper use of the switch-hook. On the whole Col. Mount thinks it fair to give Hillman the benefit of the doubt.

The onus for the calamity must lie with Childs. It was not a case of failure of interlocking or mechanism, but of breakdown of block working by his incorrect manipulation of the signalling equipment. He is a man with a clear record, was well spoken of, and by temperament seemed imperturbable, but Col. Mount concludes that, in lacking due sense of responsibility and by over confidence, he deceived himself and others as to his intimate knowledge of the equipment. In order to avoid delay, with consequent inquiries, with no one present to fall back upon, he apparently became confused in trying to rectify his failure, with the result that he unsealed his instruments in circumstances to which the special instructions did not apply. Had he realised their purport, and the danger of such action, no doubt he would have adopted the proper course and sought assistance in flagging the South London train.

A review of all the details leads Col. Mount to conclude that Childs most likely reset the up local plunger indicator from "train on" to blank by his hand coming against the relative cancelling button—the action of which did not require the co-operation of Pouparts Junction—while replacing the front of the case. The switch-hook could not then have been turned, as the block indicator in the rear was lowered, and Childs, in his dilemma, had most likely by then overlooked the London Bridge train altogether, so on receipt of Hillman's bell signal for the Coulsdon train he accepted it in his confusion in the regulation manner, as Hillman asserts. Childs' suggestion that he pressed the block plunger with his body appears hardly tenable.

Remarks and Recommendations

This accident again drew attention to the behaviour of rolling stock in collision. The rear motor coach of the London Bridge train, in which nine of the ten fatalities occurred, was telescoped when the leading motor coach of the Coulsdon train overrode it; the momentum of the latter train had to be absorbed. Had the coach bodies been materially stronger the results might have been different, but Col. Mount finds it impossible to say whether casualties would have been more or less serious.

"Resistance to collision is not the primary consideration in the design of rolling stock; nor can dynamics be eliminated by the use of what is called 'all steel' construction. But if wood is kept away from electrical equipment, and coupling and buffer gear are adequate, the passenger-carrying portion of the bodies even of motor coaches, on surface railways, need not necessarily be composed entirely of steel, if the various other considerations concerned do not justify such construction." The right policy is to direct available resources towards prevention of accidents rather than minimising their effects.

Since the instruments of this electro-mechanical Sykes system of signalling have been sealed, an instruction has been in force for many years authorising the signalman to break the seals in the event of the special cancelling apparatus failing; but, in the circumstances described, this action was both unusual and unnecessary, and certainly should not have been taken by an experienced signalman. One means of preventing a recurrence is to apply padlocks in place of the seals, and this was immediately adopted. No one except the skilled lineman will be able in future to open the instruments; the instructions have been withdrawn. At the same time, the depression of the plunger cancellation buttons has been prevented, except after removal of split pins; the use of this release will thus require more deliberate action.

This is a satisfactory temporary measure, but Col. Mount recommends that the co-operative feature should now be applied, if practicable, as an emergency safeguard in connection with the cancellation of the three plungers for trains approaching Victoria.

Similarly, Col. Mount suggests that the function and use made of the switch-hook, both here and under ordinary Sykes operation deserves consideration, having regard to the differing practices now in force on the Central, Eastern, and Western Sections. It was presumably designed to act as a reminder of the occupation of the section, and as an additional safeguard against the second plunge, in which case its application on acceptance, or on receipt of "entering section," should apparently be made obligatory. This appears particularly necessary where, as at Battersea Park, the block clearance point is ahead of the signal, the replacement of which restores the block indicator in rear to normal and re-sets the plunger for a second acceptance.

It would also be well to consider the justification for, and practicability of, substituting the company's latest form of manual block with its associated track circuiting or the equivalent, or of introducing increased safeguards in connection with the block release, where the ordinary Sykes system is retained in operation under the dense traffic conditions of the suburban areas.

Relief Signalman Childs' actions showed that even a man with a good record and long experience cannot necessarily be trusted to take charge of a box of this character without the most careful supervision and examination under peak conditions; no doubt procedure will be tightened up to ensure an intimate knowledge of all special instructions, of the detailed working of all equipment, and of the steps to be taken in every kind of emergency.

The London Bridge train might not have been overlooked had a booked entry been made in a train register. This would necessitate the re-establishment of a booking lad, a step which appears to be desirable in the interests of safety and efficiency, at this particular box and under the present system of signalling, having regard to its location and importance in respect of train description. In the meantime, a mirror is being provided to assist the signalman in observing head codes of up trains. On a busy frame of this kind, any relief of strain seems justified.

"Train-waiting" track circuit in rear of the home signal would, Col. Mount points out, have prevented this accident, but track circuiting is not a usual, nor a normally necessary adjunct to any system of lock and block. Moreover, this electro-mechanical installation has stood the test of nearly 30 years' service under the most trying suburban conditions; indeed, it might well be claimed that such dense traffic could not otherwise have been worked with the same measure of safety and facility. Further, the home signal concerned did not, of course, differ in principle from the large number of others where this block system exists.

During the last ten years, however, the company has carried out an exceptional amount of re-signalling of modern colour-light type, employing continuous track circuiting; much credit is due for the progress already made, and the programme is not yet complete. All its London terminal stations have been dealt with, except Victoria (Central side); the scheme for this is under consideration. Reference has been made to the density of traffic at the time of this accident, to its heavy increase during the last five years due to the extension of electrification, and to the pressure on any manual block system which such density entails; the elimination of the latter is of importance under modern requirements of still closer headway; the reconstruction of this installation should now be proceeded with, although it must necessarily take some time to effect.

Col. Mount also hopes that early consideration will be given to the extension of this programme, to link up via Streatham and Croydon with the existing colour-light signalling below Coulsdon.

STAFF AND LABOUR MATTERS

Railway Staff National Tribunal

The public hearing of the wage claims of the three railway trade unions before the Railway Staff National Tribunal was concluded on Wednesday, July 28.

The Railway Rates Tribunal Decision

The first part of the final day's proceedings was devoted to comments upon the announcement appearing in the press that morning concerning the decision of the Railway Rates Tribunal in regard to an increase in railway charges. As recorded on page 212 of our issue of last week, Mr. Kerr informed Sir Arthur Salter (Chairman), that until the full judgment was available and had been considered in detail, the companies were not in a position to say what reduction should be made in the companies' estimate of £5,289,000, as the yield of the increase on charges proposed by them to the Railway Rates Tribunal.

Mr. Marchbank then addressed the tribunal on the effect which the increase in rates and charges will have upon the companies' revenues. He read extracts from the proceedings of the Railway Rates Tribunal in June last, suggesting as he put it " that a fairly full margin has been allowed for what may be regarded as prospective losses in traffic as a result of the increased charges."

Mr. Marchbank suggested that a revised estimate of probable future net revenue was just over £41 millions, compared with £37¾ millions, which was the net revenue in respect of the year 1936. While it might be argued that materials purchased by the companies were rising in price, he called attention to the effect of increases in commodity prices upon the workers and he thought the position now showed an upward trend, while there were " even better prospects " for the future. He had every confidence that the tribunal would take these factors into account when considering its findings. Mr. Squance, for the Associated Society of Locomotive Engineers and Firemen, and Mr. Stott, for the Railway Clerks' Association, also spoke briefly on the improvement in the companies' revenue which was likely to result from the increase in rail charges.

Union Advocates Questioned

Sir Arthur Salter then put a number of questions to the advocates, making it clear that these were necessary to fill in the gap caused by the fact that the advocates on the two sides did not cross-examine each other before the tribunal. The questions were intended to elucidate matters which had arisen in the course of the submissions of the parties during the previous week.

Mr. Marchbank was asked concerning the cost of living, and also as to the number of adult male staff whose base rates were less than 40s. a week; he agreed that there would not be more than 100 of such staff altogether.

Mr. Squance was questioned closely on the contention that enginemen had a stronger case for the claim for a guaranteed day for each time of signing on duty on Sundays than had other grades. In response to further questions Mr. Squance also pressed the claim for increased holidays for drivers and firemen, on the ground of the " remarkable degree of speeding up in recent years." Sir Arthur asked Mr. Squance a number of questions bearing on duties worked on Bank Holidays and on the workings of the Sunday before and the Sunday after a man's annual holiday.

Mr. Stott, in reply to questions on his claim for special increases in pay for those members of the salaried grades for whom promotion was not available, said that the clerical staff of the Railway Clearing House had a " rather special case " which was " undeniably worse " than that applicable to the clerical staff of the main-line railways. Concerning the cost of living, Mr. Stott admitted it was true that his members had had during the depression, a substantial " offset " as against the pay cuts in a fall in the cost of living, by comparison with what it was when the rates of pay were fixed by the national agreements.

Mr. Kerr Questioned

It was now the turn of Mr. Kenelm Kerr, the companies' spokesman, to submit to cross-examination from the chair, and Sir Arthur's searching questions related almost entirely to financial matters. Mr. Kerr gave a carefully worded explanation of the allocation of the recoveries of rating relief to the various reserve funds. Sir Arthur had said he was anxious to find the fairest figure by which the tribunal could consider net revenue would be increased from year to year as a result of rating relief, and Mr. Kerr suggested that the figure of £2,211,403 in respect of the year 1934 was perhaps the most typical and most appropriate to rely upon. Questioned further, Mr. Kerr replied that £2¼ millions was not very far from a true average.

Mr. Kerr answered a series of questions concerning the reserve funds of the companies, and made it clear that such revenue as arose from the possession of these funds, in so far as they were not actually in use in the companies' business, was reflected in the net revenue. Mr. Kerr showed, too, that the companies had not restored to the various funds in bulk, the withdrawals during the years of the " depression." Asked to explain the basis of the estimated increased expenditure of about £7 millions given in evidence before the Railway Rates Tribunal, Mr. Kerr said there were two main factors, namely, materials and labour. On the basis of the 1936 quantity, at the June, 1937, prices, materials would account for £5,017,000. The labour factor of £2,603,000 was made up of increased payments resulting from the Staff Tribunal's Decision No. 1, and from the employment of increased numbers of staff. The total of £7,620,000 included an element in relation to expenditure not chargeable to revenue but to capital. " The element chargeable to revenue," said Mr. Kerr, " is £7 millions."

Mr. Maurice Gibb, a member of the tribunal, asked Mr. Kerr to state what allowance—in arriving at the net revenue figures—had been allowed for depreciation on the total capital of the companies of eleven hundred million pounds. Mr. Kerr said that in the form in which railway accounts were dealt with—and these accounts, he added, were determined by statutory regulation—there was no separate fund for depreciation. On the other hand, the sums which in ordinary commercial parlance would be described as reserves against depreciation or obsolescence, were included in " renewal " funds and the total of these funds was modest in relation to the total capital involved.

Sir Arthur Salter's Promise

In concluding the public hearing, Sir Arthur Salter said it must not be expected " that a very early award will be given." The tribunal had a great deal of information to consider and was likely to be some little time before it was in a position to give an award, but he promised that there would be " no undue delay."

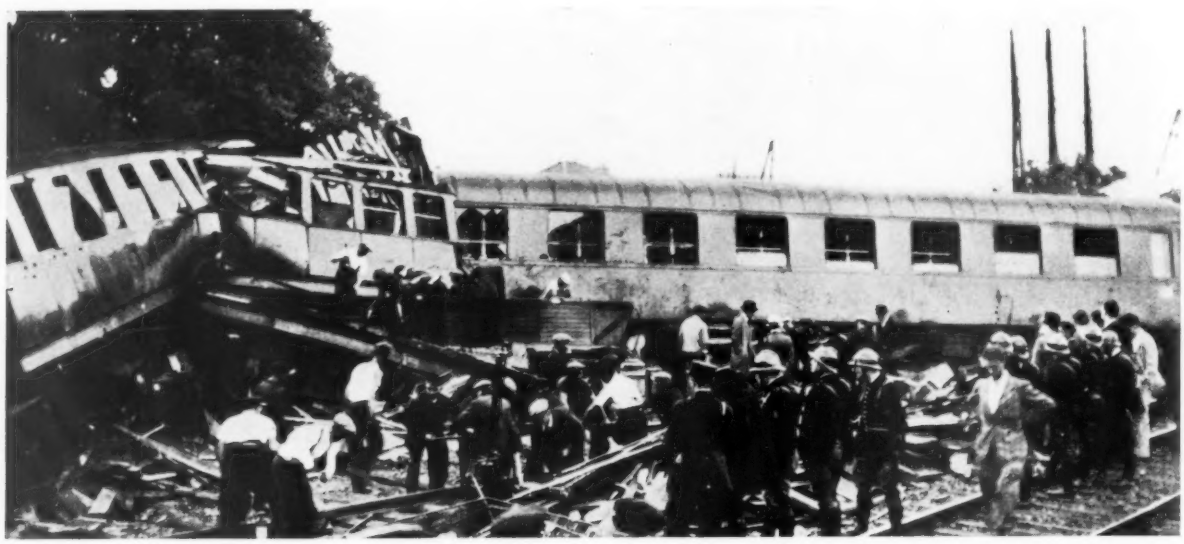
£7,000,000 CHINESE RAILWAY LOANS: CONTRACTS CONCLUDED WITH BRITISH AND CHINESE CORPORATION.—A contract for a £3,000,000 5 per cent. loan for the construction of a railway from Shetkan, on the Canton-Kowloon Railway, to Meihsien, in Eastern Kwangtung, has been concluded with the British and Chinese Corporation by Mr. H. H. Kung, the Chinese Finance Minister, on behalf of the Chinese Government. The loan is secured on the revenues of the railway, with the salt gabelle as a collateral. Part of the money is to be used for the purchase of material and equipment for the building of the line. It is expected that the loan will be offered for public subscription in London in due course, states a Reuters message from Shanghai. The Chinese Finance Minister has also concluded a further loan contract with the British and Chinese Corporation for £4,000,000, for the construction of a railway from Pukou, on the bank of the River Yangtse, opposite Nanking, to Hsiangyang, in Hupeh Province. The terms of the loan are the same as those of the £3,000,000 contract. This brings the total loan contracted for with British financiers to £7,000,000.

Serious Accident on P.L.M. Railway

A serious accident, involving the death of 29 persons, occurred late on July 29 at Villeneuve-St. Georges, about 9¼ miles from Paris, on the P.L.M. Railway. The train concerned was No. 1017 due to leave Paris at 10.35 p.m. for St. Etienne, Vichy and Nimes via Corbeil. This, it is said, was incorrectly described to the junction as train No. 511, which leaves Paris at 10.50 p.m. for Vallorbe and Switzerland via Melun. The route was accordingly set for the Melun direction, but the description being subsequently corrected the facing points were altered for the Corbeil direction under the train, though how this was possible has not been explained. The train, travelling at an estimated speed of 50 m.p.h., was derailed. The standard Pacific type locomotive appears to have split the points. It came to rest, with its tender, in the fork of the junction. The coupling broke between the tender and the first vehicle, a lightly constructed 6-wheel van, which was pushed forward along the Corbeil line and wrecked by the following steel postal van, which was also derailed. The front of the next vehicle, a second class steel coach, followed the Corbeil line, but its other end went along the Melun line. It came to rest with the middle of its near side in contact with the tender. Behind this steel coach was a wooden bodied third class coach which was badly telescoped and in which nearly all the casualities occurred. Fire broke out but was extinguished before obtaining serious hold.

From the evidence given before the examining magistrate who conducted the inquiry, as far as it has yet appeared in the French press, the No. 5 (Junction) signal box at Villeneuve is of the most modern type (power working has been in use there since 1907). There were two signalmen on duty, a chief and an assistant, and they declared that the train was first signalled to them as No. 511, but just before it was due the despatcher at Paris informed them that No. 1017 was running first. They placed the signals to "danger," but the driver, who was badly burned, and has since unfortunately died in hospital, declared that the outer signal was off when he passed it, as well as the others further on. The assistant signalman then proceeded to reverse the facing points and said that as he was doing so he saw from the track diagram that the train was on them. The point tongues appear to have been just in motion at the instant the front wheels of the locomotive reached them, and the derailment followed. Whether there was any electric approach route, or back locking, which was cancelled by the signalmen using some emergency release, does not appear, but presumably there was. Such a facility, of course, should never be used until the signalman has first assured himself that the train has come to a stand at the outer signal. Only a time release gear could have prevented the blunder, once cancellation had been begun. Some of the statements in the press are conflicting and difficult to understand, but two reports say that the chief signalman admitted his responsibility and did not seek to divide it with anyone else. Before it is established where the locomotive was when the signals were placed to "danger" it is impossible to judge whether the driver ought not to have realised the position sooner. His alleged statement that all the signals were off can scarcely be correct. It is not clear from the reports whether there is any indication of route given at this junction, from which the driver could have told—assuming the junction signals were off when he saw them first—that the wrong route was set up for him.

The P.L.M. main line carries a very heavy traffic and has a good safety record, making this accident a matter for deep regret. A general description of P.L.M. signalling was published in THE RAILWAY GAZETTE for April 6, 1934, page 566.



Wreckage of wooden coach telescoped by steel coach in the Villeneuve-St. Georges accident, P.L.M. Railway

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IMPROVEMENTS TO SHEFFIELD (VICTORIA) STATION.—A comprehensive scheme of modernisation and improvement at Victoria station, Sheffield, is to be put in hand forthwith by the L.N.E.R. The alterations will include an enlarged booking hall with new booking and enquiry offices, and direct access to the Royal Victoria Station Hotel, the removal of the war memorial to a more suitable and protected site, improved lighting on the station approach road, a new central underground lavatory for men, and modernised first and third class accommodation for ladies.

The public rooms on platform No. 3 will be re-arranged and a new telegraph office and improved cloak room facilities provided. To provide increased space, the wooden erections which encumber the platforms will be removed, and a new bookstall will be built.

QUESTIONS IN PARLIAMENT

Anglo-Argentine Railways

Sir Nicholas Grattan-Doyle (Newcastle-upon-Tyne—N.-C.) on July 27 asked the Secretary of State for Foreign Affairs whether he was aware that any renewal of the Anglo-Argentine trade agreement would be opposed by British investors, in view of the Argentine Government's refusal to allow the Anglo-Argentine railways to earn a profit on their ordinary capital as a result of the exchange tax by the peso being fixed at more than 15 to the £ and by the non-granting of the revision of railway charges notwithstanding the prosperity of Argentine agriculture; and would he, on behalf of British investors, take up the matter with the Argentine Government independently of the directors of the railway companies concerned.

Viscount Cranborne (Under Secretary of State for Foreign Affairs): I understand that negotiations are in fact in progress between the responsible Argentine authorities and the representatives of the railway companies concerned.

Accidents at Level Crossings

Mr. A. M. Lyons (Leicester, E.—U.) asked the Minister of Transport if he could state the number of accidents on, and at, level crossings during 1936, and the number up to the last convenient date in 1937.

Dr. Burgin (Minister of Transport) wrote in reply: The figures for 1936 are set out in full on page 15 of the Annual Report on Railway Accidents which was recently presented to Parliament. The figures for the first six months of 1937 can only be given provisionally and are as follow:—

LEVEL CROSSING ACCIDENTS
JANUARY 1 TO JUNE 30, 1937

	Total cases reported (including accidents to pedestrians)	Cases where material damage to gates, road vehicles or cattle has alone resulted	Cases in which casualties occurred	Actual casualties	
				Killed	Injured
Public road crossings with gates ...	54	50	4	–	4
Public road crossings without gates	7 } 61	6 } 56	1 } 5	1 } 1	– } 4
Occupation crossings	16	9	7	4	3
Footpath crossings	8	—	8	7	2
Totals	85	65	20	12	9

Railway Travelling Concessions

Mr. W. J. Anstruther-Gray (North Lanark—C.) asked the First Lord of the Admiralty whether he was aware that Dartmouth cadets received no concessions in the way of reduced railway fares when travelling to and from Dartmouth, notwithstanding the fact that they wore uniform when so doing; and whether he would consider granting such concessions.

Lieut-Colonel J. J. Llewellin (Civil Lord of the Admiralty) wrote in reply: The railway travelling concessions enjoyed by naval personnel are granted by the companies and not at the expense of Naval funds. The companies have been asked to grant such concessions to Dartmouth cadets, but they have declined to differentiate between them and public schoolboys, and I do not think that a further approach to the companies would serve any useful purpose.

Tube Railways and Poison Gas

Mr. Wilfrid Roberts (Cumberland, N.—Lib.) on July 28 asked the Minister of Transport whether steps had been taken to render the tube railways proof against poison gas.

Dr. Leslie Burgin (Minister of Transport): I can assure the hon. member that the matter has been taken into consideration.

Bridges Over Railways

Mr. A. T. Lennox-Boyd (Bedford, Mid.—U.) on July 28 asked the Minister of Transport how many bridges over railways had been classified as weak; and how many of these it was proposed to reconstruct.

Dr. Leslie Burgin: 2,050 bridges over railways in Great Britain have been classified as weak. Proposals for reconstructing 1,015 of these have been notified by highway authorities.

Railway Level Crossings

Mr. A. T. Lennox-Boyd (Bedford, Mid.—U.) on July 28 asked the Minister of Transport how many level-crossings there were and how many of these it was proposed to replace with bridges this year.

Dr. Leslie Burgin: There are, approximately, 4,560 railway crossings on classified and unclassified roads in Great Britain, of which 1,082 are on classified roads. I propose to undertake forthwith five schemes to avoid level crossings on trunk roads and five grants for the elimination or avoidance of level crossings on other roads have been made during this financial year. Highway authorities have scheduled 28 other schemes as due for commencement, but I am unable to state when it will be possible to put all these in hand.

Mr. H. Day (Southwark Central—Lab.) on July 30 asked the Minister of Transport whether he could state the number of points estimated on Class 1 roads in Great Britain where there were level crossings of more than ordinary importance; what sum had been allocated during the current financial year towards the elimination or bridging of the same; and would he give particulars of the number of level crossings that would be so eliminated.

Dr. Leslie Burgin: According to information in my department, the number of railway level crossings on Class 1 roads is 662. I can only judge of their relative importance by the initiative taken by highway authorities. No separate provision for eliminating or avoiding level crossings is necessary; highway authorities are aware that approved schemes are eligible for grants at the exceptional rate of 75 per cent. Five grants have been made this year and others are now under consideration.

Argentine and Brazilian Railways

Sir Nicholas Grattan-Doyle (Newcastle-on-Tyne North—C.) on July 29 asked the Chancellor of the Exchequer whether he was aware that it would be useless to reconsider revising the embargo on the issue of foreign loans, in the expectation that British investors would again lend their savings abroad for the benefit of British export trade, while the present treatment of their savings invested in Argentine and Brazilian railways was allowed to continue without vigorous protest by His Majesty's Government; and would he now take immediate steps in defence of these British investments.

The Chancellor of the Exchequer (Sir John Simon): I am aware that, while the general position of investors in Argentine and Brazilian railway securities has recently shown a welcome improvement, the position as regards a number of such securities remains unsatisfactory to the holders. In the event of difficulties arising which cannot be settled by direct discussion between the British companies and the foreign authorities concerned, His Majesty's Government would be ready to consider any request for support made by such companies. Apart from this, I do not think that there are any steps which His Majesty's Government can usefully take at the present time.

Steel Railway Coaches

Lieut.-Commander R. Fletcher (Nuneaton—Lab.) on July 30 asked the Minister of Transport what was the proportion of all-steel coaches to wooden coaches employed on British railways as compared with French; whether he had any information indicating that the use of steel coaches minimised danger to life in accidents, enabling higher speeds to be maintained than with wooden coaches; if the progressive employment of steel coaches

was accompanied by a diminution of fatal accidents on the railways; and whether the 75 per cent. of steel employed in British passenger rolling stock was employed in the chassis or bodywork construction.

Dr. Leslie Burgin: The information at my disposal does not enable me to make the comparison asked for in the first part of the question. I have no evidence that the use of steel coaches has the results suggested in the second and third parts. As regards the last part, steel is employed in both the chassis and the bodywork.

Sir Percy Harris (Bethnal Green, S.W.—Lib.): Has the right hon. gentleman seen the account of a very serious accident in France where steel coaches withstood the shocks while wooden ones were destroyed?

Dr. Burgin: I have seen the report, but the whole question of steel coaches is rather confusing. What we call wooden coaches in England are 75 per cent. steel.

Railway and Other Reports

Great Western Railway.—The gross receipts from railway and ancillary businesses for the half-year ended June 30, 1937, were £887,000 more than in the corresponding period of last year. Expenditure on railway and ancillary businesses increased by approximately £347,000. The increase in net revenue from all sources amounted to £500,449. The total increase in railway receipts was £694,000; passenger train receipts showing an increase of £224,000, goods train receipts an increase of £462,000, and miscellaneous receipts an increase of £8,000. The directors have decided to declare an interim dividend of ½ per cent. on the consolidated ordinary stock for the half-year ended June 30, which compares with a dividend of ¼ per cent. for the half-year to June 30, 1936. Dividend warrants will be posted on August 18.

Rohilkund & Kumaon Railway.—Gross earnings of the open system for the half-year ended March 31, 1937, amounted to Rs. 40,46,490, an increase of Rs. 89,662 in comparison with those for the corresponding period of 1936. In the working expenses of Rs. 16,28,541 there was a decrease of Rs. 1,17,310, so that the net earnings of Rs. 24,17,949 showed an improvement of Rs. 2,06,972, and the operating ratio was reduced from 44·12 per cent. to 40·25 per cent. The company's share of net earnings for the half-year is £81,541 (against £72,451), which, together with £21,264 brought forward and £421 gain by exchange, makes a total of £103,266. After providing for United Kingdom taxes, debenture interest and preference dividends, and for the Secretary of State's share of surplus profits, the directors have declared an interim dividend of 4 per cent. and a bonus of 3 per cent., or 7 per cent. in all, less tax at 2s. 8d. in the £, for the half-year on the ordinary stock, leaving £42,061 to be carried forward.

NOTES AND NEWS

Crewe Station and Aerodrome.—On July 28 the General Purposes Committee of Crewe Town Council decided to recommend the purchase of 345 acres of the Crewe Hall estate for establishing an aerodrome at a cost of £45,000. The site is adjacent to the Crewe railway station and it is proposed to make an underground passage from the station and the post office to connect with the aerodrome.

"A.B.C. Railway Guide."—The firm of Jordan & Sons announces the registration of Thomas Skinner & Co. (Publishers) Ltd., to take over the goodwill and certain other assets of the business of Thomas Skinner & Co., and to acquire from Sir Hewitt Skinner, the proprietorship and goodwill of the "A.B.C. Railway Guide." The nominal capital is £350,000 in 175,000 preference shares of £1, and 700,000 ordinary shares of 5s.

French Railway Deficit Expected to be Nearly Halved.—On July 30, M. Bonnet, the French Finance Minister, stated that the deficit on the French railways will be reduced to about fr. 3,600,000,000 (about £27,000,000) as a result of the increase in fares and rates and the proposed reorganisation of the railways. The deficit at present amounts to nearly fr. 6,000,000,000 (approximately £45,000,000), states a Reuters message from Paris.

The Scotswood Works.—Sir W. G. Armstrong, Whitworth & Co. (Engineers) Limited, announces that it has disposed of its Scotswood works, Newcastle-on-Tyne. Vickers-Armstrongs Limited announces that it is entering into an arrangement with the purchaser under which it will lease the works from August 2, 1937, from which date these works are being operated by Vickers-Armstrongs Limited as part of its Elswick establishment. Arrangements have been made between the parties for completion of the work on hand on existing orders.

G.W.R. Locomotive Names.—The G.W.R. has renamed twenty of its "Castle" class locomotives, Nos. 5043 to 5062, inclusive, as follow: *Earl of Mount Edgcumbe, Earl of Dunraven, Earl of Dudley, Earl Cawdor, Earl of Dartmouth, Earl of Devon, Earl of Plymouth, Earl of St. Germans, Earl Bathurst, Earl of Radnor, Earl Cairns, Earl of Ducie, Earl of Eldon, Earl of Powis, Earl Waldegrave, Earl of Clancarty, Earl St. Aldwyn, Earl of Berkeley, Earl of Birkenhead,* and *Earl of Shaftesbury*. Engine No. 5063, of the same class, has been named *Earl Baldwin* and attached to the Worcester sheds. Earl Baldwin's family has been connected with the G.W.R. since 1901, when his father, Mr. Alfred Baldwin, joined the board; he became Chairman of the company in 1905. In 1908, Earl Baldwin—then Mr. Stanley Baldwin—joined the board and resigned in 1917 on his appointment as a Junior Lord of the Treasury. In February of this year (1937) his son, Mr. Arthur Windham Baldwin, joined the board. Two further engines of the "Castle" class, Nos. 5064 and 5065, are to be re-named *Bishops Castle* and *Newport Castle* respectively.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of June, 1937, amounted to $11,419,000, an increase of $462,000 in comparison with June, 1936. In the working expenses of $10,224,000 there was an increase of $442,000, leaving net earnings $20,000 higher, at $1,195,000. Aggregate gross earnings for the first six months of 1937 were $66,790,000, an improvement of $4,746,000, and the net earnings of $8,260,000 were higher by $1,469,000.

Canadian National Earnings.—For the month of June, 1937, gross earnings of the Canadian National Railways amounted to $16,091,901, an increase of $1,352,136 over June, 1936. Operating expenses ($15,656,713) advanced by $926,391, to leave net earnings of $435,188, which were $425,745 higher than for June, 1936. Aggregate gross earnings from January 1 to June 30, 1937, were $94,996,314, an improvement of $9,534,886, and the net earnings for the six months were $6,667,948, an increase of $4,192,908 over those for the corresponding period of 1936.

"Railroad Renaissance."—No. 2 of the third year issue of a series of news films, entitled "The March of Time," shortly to be released, contains an interesting item on the way in which recent world depression combined with the appearance of other means of transport in the form of private motorcars, buses, lorries, and aeroplanes, affected the revenue and the personnel of U.S.A. railways. The methods used to combat these influences, which compelled a private monopoly to fight for its existence, are excellently described and illustrated. Attention is not devoted entirely to the introduction of streamlined trains, but also to goodwill campaigns, special services, co-operative agencies, and the adoption last year of a maximum fare of 2 and 3 cents a mile for ordinary coach and Pullman passengers respectively. This instructive and entertaining film will be showing in London during the week beginning August 9, at the Tatler theatre, Charing Cross Road, and at the Cameo, Leicester Square.

New Tyneside Trains.—On July 30 the first of the new eight-car electric trains for the L.N.E.R. Tyneside services was brought into traffic officially by the Lord Mayor of Newcastle, who drove the train out of Newcastle Central station for the first part of its initial journey round the north Tyneside circle. After the inaugural trip, there was a luncheon at the Central Station hotel

presided over by Mr. C. M. Jenkin Jones, the Divisional General Manager of the North Eastern Area. Others present at the ceremony included, in addition to the Lord Mayor and Sheriff of Newcastle, a number of civic officers from local towns, and the following L.N.E.R. (N.E. Area) officers :—

Mr. S. T. Burgoyne, Superintendent ; Mr. E. M. Rutter, Passenger Manager ; Mr. F. E. Harrison, Engineer, Mr. Taylor Thompson, Assistant Engineer, and Mr. H. Hills, District Engineer ; Mr. E. Thompson, Mechanical Engineer ; Mr. C. M. Stedman, Running Superintendent ; Mr. G. L. Drury, Area Electrical Engineer, and Mr. H. W. Green, District Electrical Engineer ; Mr. F. C. C. Stanley, District Passenger Manager, and Mr. H. A. Butcher, Stationmaster, Newcastle Central

An hour after the inaugural trip, the new train was put into regular service on the 1.0 p.m. express to Whitley Bay.

Krupp Locomotive for China.—In connection with the illustrated description of the new 2-10-2 type locomotive built by Fried. Krupp A.G., for the Tientsin-Pukow Railway, published on page 205 of last week's issue, it has been pointed out to us by Clyde Blowers Limited, Glasgow, that this engine is fitted with two Clyde blowers, one on each side of the firebox. Our illustration showed a blower on the left-hand side with operating rod to the cab ; a duplicate of this blower is also fitted on the right-hand side. In the list of boiler fittings published on page 206 of the article it was stated that only one Clyde soot blower was provided on the engine.

Loudspeakers in L.M.S.R. Freight Yards.—In order to assist the staff in the quicker and more efficient handling of traffic in freight marshalling yards, the L.M.S.R. is to instal loudspeaker telephone systems at nine of its important shunting centres, as follow : Crewe (Sorting Sidings North), Carlton South Sidings and Stourton (near Leeds), Bolton, Stoke-on-Trent, Brindle Heath and Windsor Bridge (Manchester area), Ince Moss (near Wigan), and Toton (near Nottingham). The decision to instal this equipment has been made following successful experiments in the London, Derby, and Manchester areas.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 30th Week			Totals to Date		
	1937	1936	Inc. or Dec.	1937	1936	Inc. or Dec.
L.M.S.R. (6,871 mls.)	£	£	£	£	£	£
Passenger-train traffic	1,104,000	1,032,000	+ 72,000	15,327,000	14,694,000	+ 633,000
Merchandise, &c.	469,000	441,000	+ 28,000	14,667,000	14,222,000	+ 445,000
Coal and coke	221,000	225,000	– 4,000	7,716,000	7,240,000	+ 476,000
Goods-train traffic	690,000	666,000	+ 24,000	22,383,000	21,462,000	+ 921,000
Total receipts	1,794,000	1,698,000	+ 96,000	37,710,000	36,156,000	+1,554,000
L.N.E.R. (6,315 mls.)						
Passenger-train traffic	658,000	600,000	+ 58,000	9,953,000	9,472,000	+ 481,000
Merchandise, &c.	326,000	332,000	– 6,000	10,117,000	9,705,000	+ 412,000
Coal and coke	215,000	213,000	+ 2,000	7,395,000	6,947,000	+ 448,000
Goods-train traffic	541,000	545,000	– 4,000	17,512,000	16,652,000	+ 860,000
Total receipts	1,199,000	1,145,000	+ 54,000	27,465,000	26,124,000	+1,341,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic	472,000	440,000	+ 32,000	6,380,000	6,162,000	+ 218,000
Merchandise, &c.	216,000	205,000	+ 11,000	5,942,000	5,721,000	+ 221,000
Coal and coke	110,000	101,000	+ 9,000	3,359,000	3,010,000	+ 349,000
Goods-train traffic	326,000	306,000	+ 20,000	9,301,000	8,731,000	+ 570,000
Total receipts	798,000	746,000	+ 52,000	15,681,000	14,893,000	+ 788,000
S.R. (2,157 mls.)						
Passenger-train traffic	593,000	538,000	+ 55,000	9,583,000	9,050,000	+ 533,000
Merchandise, &c.	65,000	70,000	– 5,000	1,830,000	1,889,500	– 59,500
Coal and coke	29,000	32,000	– 3,000	909,000	929,500	– 20,500
Goods-train traffic	94,000	102,000	– 8,000	2,739,000	2,819,000	– 80,000
Total receipts	687,000	640,000	+ 47,000	12,322,000	11,869,000	+ 453,000
Liverpool Overhead (6½ mls.)	1,395	1,259	+ 136	38,354	35,047	+ 3,307
Mersey (4½ mls.)	4,214	4,006	+ 208	125,249	120,733	+ 4,516
*London Passenger Transport Board	551,900	546,700	+ 5,200	2,820,200	2,787,400	+ 32,800
IRELAND						
†Belfast & C.D. (80 mls.) pass.	4,572	4,335	+ 237	75,387	77,432	– 2,045
,, ,, goods	452	615	– 163	14,895	16,904	– 2,009
,, ,, total	5,024	4,950	+ 74	90,282	94,336	– 4,054
Great Northern (543 mls.) pass.	20,350	15,900	+ 4,450	310,650	303,900	+ 6,750
,, ,, goods	9,750	10,700	– 950	282,600	297,900	– 15,300
,, ,, total	30,100	26,600	+ 3,500	593,250	601,800	– 8,550
Great Southern (2,076 miles) pass.	55,775	52,883	+ 2,892	1,009,510	1,014,344	– 4,834
,, ,, goods	41,571	43,199	– 1,628	1,228,459	1,243,997	– 15,538
,, ,, total	97,346	96,082	+ 1,264	2,237,969	2,258,341	– 20,372

* 5th week (before pooling) † 31st week
Week preceding August Bank Holiday, 1937 and 1936

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices Aug. 4, 1937	Prices Rise/Fall
G.W.R.				
Cons. Ord.	64¼	45½	65¾	–½
5% Con. Prefce.	126½	116¾	117½	—
5% Red.Pref.(1950)	113	108½	111½	—
4% Deb.	119½	110½	106	—
4½% Deb.	121	114	111	—
4½% Deb.	129	121	117½	—
5% Deb.	141	134	128½	—
2½% Deb.	79⅛	74	69½	—
5% Rt. Charge	136½	130	127½	—
5% Cons. Guar.	135¼	127¾	126	—
L.M.S.R.				
Ord.	35⅝	17	33	–2
4% Prefce. (1923)	83	52½	78½	–½
4% Prefce.	92¾	81	86	—
5% Red.Pref.(1955)	109¼	103¼	106	+1
4% Deb.	111¾	105 9/16	102	—
5% Red.Deb.(1952)	119⅝	115½	112⅛	—
4% Guar.	106¾	101⅝	101	—
L.N.E.R.				
5% Pref. Ord.	14	9	10¾	–½
Def. Ord.	7¼	4¾	5⅝	–⅛
4% First Prefce.	79¼	55¼	74	–½
4% Second Prefce.	31⅞	18¼	30	–½
5% Red.Pref.(1955)	100½	77¾	99	+1
4% First Guar.	104½	98¾	99	—
4% Second Guar.	99	90	91½	—
3% Deb.	85¾	79	76	—
4% Deb.	109¾	104½	101	—
5% Red.Deb.(1947)	116¼	110½	110½	—
4½% Sinking Fund Red. Deb.	111½	107½	108	+1
SOUTHERN				
Pref. Ord.	98¾	82½	94	—
Def. Ord.	27⅝	20⅛	23¼	–¼
5% Pref.	120¾	118½	116½	—
5% Red.Pref.(1964)	119¾	115¼	115½	—
5% Guar. Prefce.	136	129½	127	—
5% Red.Guar.Pref. (1957)	120	115¾	115½	—
4% Deb.	117 5/16	109½	104	—
5% Deb.	140	134	126½	—
4% Red. Deb. 1962–67	116½	110	106½	—
BELFAST & C.D.				
Ord.	9	4½	4	—
FORTH BRIDGE				
4% Deb.	107	105	101½	—
4% Guar.	107 5/16	104	100½	—
G. NORTHERN (IRELAND)				
Ord.	19½	9¾	7	—
G. SOUTHERN (IRELAND)				
Ord.	63	41	33	—
Prefce.	65	46	41	—
Guar.	97¼	81	71	—
Deb.	99¾	83¼	85¼	—
L.P.T.B.				
4½% "A"	127¾	121	115½	—
5% "A"	138¼	133½	125½	—
4½% "T.F.A."	111½	108⅛	105	—
5% "B"	131¾	123¾	117½	—
"C"	112½	93	82	—
MERSEY				
Ord.	40¾	23	30½	+5
4% Perp. Deb.	103	98	97*	—
3% Perp. Deb.	78	74⅝	74½*	—
3% Perp. Prefce.	68⅞	63¼	65½	—

* ex dividend

CONTRACTS AND TENDERS

Locomotives for Rhodesia

Beyer, Peacock & Co. Ltd. has received an order from the Rhodesia Railways for six 2-8-2 + 2-8-2 Beyer-Garratt articulated locomotives designed for service on the 60-lb. rail, 3-ft. 6-in. gauge. These engines constitute a repeat order of the eight delivered by the same firm to this administration in 1929.

Large Coach Order for Kenya & Uganda Railways

Metropolitan-Cammell Carriage & Wagon Co. Ltd. has received an order from the Crown Agents for the Colonies for the following metre-gauge bogie main line coaching stock, required for the Kenya & Uganda Railways: 29 third class coaches, three second class coaches, one first class coach, one brake van, one restaurant car and two first-second composite coaches. These coaches are to be of all-steel construction with welded underframes and bogies. The bodies will be insulated with limpet asbestos material to be supplied by J. W. Roberts & Co. Ltd. The stock will be fitted with standard type couplers, but the design provides for the subsequent fitting of MCB type couplers. Westinghouse compressed-air brakes will be fitted, but vacuum brakes may be substituted at a later date. Provision has been made in the designs for the subsequent conversion of these coaches from metre gauge to 3-ft. 6-in. gauge.

Whitelegg & Rogers Limited has received orders for Ajax steam operated firedoors for application to 62 existing locomotives of the South African Railways & Harbours Board and to 20 2-6-0 type locomotives under construction by the North British Locomotive Co. Ltd. for the Egyptian State Railways Administration.

Whitelegg & Rogers Limited has also received orders for Ajax air operated firedoors, for application to three locomotives for Newfoundland, under construction by the North British Locomotive Co. Ltd.

Stewarts and Lloyds Limited has received an order from the Central Argentine Railway for 2,000 non-corrosive galvanised solid-drawn steel boiler tubes, 4,500 steel boiler tube safe ends, and 1,150 galvanised solid-drawn steel superheater smoke tubes.

R. Wright & Partners Limited has received orders from the Chief Controller of Stores, Indian Stores Department, Simla, for one universal milling machine, one Nurka hot-nut press, one Nurka automatic nut-trimming and chamfering machine, and one Nurka automatic nut-tapping machine.

Alfred Herbert (India) Limited has received orders from the Chief Controller of Stores, Indian Stores Department, Simla, for machine tools as follow: One 32-in. stroke heavy-duty high-speed traverse head shaping machine, one 30-in. Duplex rapid-production boring and turning mill, one automatic lathe, one hinged-type jolt ram roll over and pattern drawing moulding machine.

Wagons for South Africa

Further information now to hand enables us to append in slightly amended form the details of the orders (briefly announced in last week's issue) for a total of 750 wagons placed by the South African Railways & Harbours Board. The orders should have been as here described and were distributed as follow:—

La Brugeoise & Nicaise & Delcuve, S.A., 100 fruit wagons.

Les Ateliers Metallurgiques, S.A., 100 fruit wagons.

Société L'Industrie, 50 fruit wagons.

Metropolitan-Cammell Carriage & Wagon Co. Ltd., 250 high-sided wagons, BB.4 type.

Birmingham Railway Carriage & Wagon Co. Ltd., 150 high-sided wagons, BB.4 type.

Ateliers de la Dyle, S.A., 100 high-sided wagons, BB.4 type.

The Associated British Machine Tool Makers Limited has received orders from the Chief Controller of Stores, Indian Stores Department, Simla, for machine tools as follow: One high-production slotting machine, one slot drilling and keyway cutting machine, one tube descaling machine, one universal tool and cutter grinding machine with hydraulic traverse, one hot-sawing and milling machine, one high stroke High Power axlebox planer, one vertical spindle Planotype surface-grinding machine, one radius link and hole grinding machine, one 36-in. double drum sanding machine.

Stanton Ironworks Limited has received an order for 2,000 metres of cast-iron piping from the Buenos Ayres Great Southern Railway.

The Associated Lead Manufacturers Export Co. Ltd. has received orders from the Great Indian Peninsula Railway through Shaw, Wallace & Co. for 50 cwt. of Cookson's sheet lead.

Thomas Bolton & Sons has received orders from the Great Indian Peninsula Railway through Alfred Herbert (India) Limited for a total of 287 cwt. of copper rod.

The Crown Agents for the Colonies have recently placed the following orders:—

Aveling-Barford Limited: Diesel rollers.

R. A. Lister & Co. Ltd.: Electric light plant.

Wm. Jacks & Co.: Expanded metal.

British Steel Piling Co. Ltd.: Floating pile driving and grabbing plant.

Vernon & Co. Ltd.: Gauze.

Bullers Limited: Insulators.

Siemens Bros. & Co. Ltd.: Iron poles.

Steel, Peech & Tozer (Branch of United Steel Cos. Ltd.): Locomotive tyres.

Rootes Limited: Mechanical horse and trailer.

Ford Motor Co. Ltd.: Motor lorries.

J. I. Thornycroft & Co. Ltd.: Motor lorries and trailers.

Whitehead Iron & Steel Co. Ltd.: Mild steel bars and reinforcement (for pile cores).

Horseley Bridge & T. Piggott Limited: Pressed steel tank for reservoir and steel poles.

C. Richards & Sons Ltd.: Rail clips.

The Gregg Car Company has received an order for one steel bogie tank wagon from the Nyasaland Railway.

The Chief Controller of Stores, Indian Stores Department, Simla, has recently placed orders with the Krupp Indian Trading Co. Ltd. for 202 straight axles and with Suren Piras & Company for 23 sets of locomotive wheels and axles.

Les Fils d'Albert Collet, through Guest, Keen, Williams Limited, has received an order from the North Western Railway of India for 25 trolleys complete with brakes, 5-ft. 6in. gauge, to load up to 10 tons.

The Quasi Arc Co. Ltd. has received an order for 162,800 electrodes for arc welding from the Buenos Ayres Great Southern Railway.

Soviet Orders Placed in the United Kingdom

The value of the orders placed in the United Kingdom by U.S.S.R. trading organisations amounted in June of this year to £1,428,956, as compared with £585,506 in June of last year. In the first half of this year the value of the orders placed was £10,985,810, as compared with £4,576,956 in the corresponding period of 1936. This represents an increase of more than 140 per cent. The following table shows orders placed and purchases made in the United Kingdom in June and in the first half of this year as compared with 1936 in respect of engineering and allied equipment and materials:—

	June, 1936	June, 1937	Jan.-June, 1936	Jan.-June, 1937
	£	£	£	£
Machinery and equipment ..	20,443	183,479	146,167	3,565,703
Ferro-alloys and steel	32,044	19,671	259,120	52,187
Non-ferrous ores	—	1,255	—	219,692
Non-ferrous metals	235,885	955,710	1,516,073	3,338,048

Important expansion has taken place in the orders for machinery and equipment which are nearly twenty-five times greater. Purchases of non-ferrous metals have more than doubled this year, while those of rubber have increased by nearly 70 per cent.

The Chief Controller of Stores, Indian Stores Department (Miscellaneous Section), invites tenders, receivable by August 23, for the supply on a running contract basis of permanent way bolts, nuts and spikes, required for the E.B., G.I.P., and N.W. Railways during the period December 16, 1937-December 15, 1938.

The Agent, North Western Railway of India, Lahore, invites tenders, receivable by August 23, for the supply of a quantity of steel plates for locomotives.

The South African Railways & Harbours Administration is calling for tenders (Contract No. 1405) for the supply and delivery of quantities of vacuum and steam pressure gauges. Tenders endorsed "Tender No. 1405 for Vacuum and Steam Pressure Gauges," should reach the Chief Stores Superintendent, Johannesburg, by September 27.

OFFICIAL NOTICES

The Rohilkund and Kumaon Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of :—
FOUR LOCOMOTIVE ENGINES AND TENDERS "P" CLASS
as per Specification to be seen at the Company's Offices.

Tenders, addressed to the undersigned, and envelope marked "Tender for Locomotives," with name of firm tendering, to be lodged not later than Noon on the 7th day of September, 1937.

For each Specification a fee of £1 will be charged, which cannot, under any circumstances, be returned.

The Directors do not bind themselves to accept the lowest or any Tender.

By Order of the Board,
J. WILLIAMSON,
Secretary.

237, Gresham House,
Old Broad Street,
London, E.C.2.
30th July, 1937.

WANTED by the Mechanical Department of a British Railway in the Argentine, Experienced Costs Clerk with Shops and Drawing Office experience for estimating work. Only men with extensive knowledge of costing shops' operations on all classes of mechanical work will be considered. Applications in confidence, giving full particulars of age, experience, training, present position, and if married or single, to "H.W.," c/o J. W. VICKERS & Co. LTD., 24, Austin Friars, E.C.2.

WANTED by the Mechanical Department of a British Railway in the Argentine, Draughtsman with extensive locomotive knowledge. Must be first class man. Preference given to those with experience in application of internal combustion engines to railway practices. Applications in confidence, giving full particulars of age, experience, training, present position, and if married or single, by letter to "K.K.," c/o J. W. VICKERS & Co. LTD., 24, Austin Friars, E.C.2.

WANTED by the Mechanical Department of a British Railway in the Argentine, Experienced Mechanical Engineering Draughtsman or Estimator. Comprehensive experience in taking out quantities and compilation of estimates for varied classes of work essential. Applications in confidence, giving full particulars of age, experience, training, present position, and if married or single, by letter to "C.D.," c/o J. W. VICKERS & Co. LTD., 24, Austin Friars, E.C.2.

WANTED FOR INDIA.—Works Inspector for large Wagon Works to take charge of Works Inspection Dept. Applicants should have had experience of inspection of railway rolling stock in a well-known Works in this country, and should be competent to undertake the inspection of component parts and completed steel carriage frames and wagons. They should be familiar with the testing of materials, and should have had good general and technical education. Salary about Rs. 700 per month, five year agreement, free passages, and provident fund, and free unfurnished quarters. Apply, by letter, with copies of testimonials, and stating age, and whether married or single to Box No. 217, c/o THE RAILWAY GAZETTE, 33, Tothill Street, Westminster, S.W.1.

ASSISTANT TO WORKS MANAGER required for large Rolling Stock Works in India engaged on the construction of all steel wagons and carriage underframes. Applicants about 30-35 years of age, should be of good general and technical education, and must have held a similar position in a Wagon Works in this country. They must be familiar with all branches of the wagon building trade, and should possess organising ability and some experience of office routine. Salary about £60 per month, five years agreement, provident fund and free passages. Home leave on re-engagment.—Apply, by letter, with copies of testimonials, stating age and whether married or single, to Box No. 287, c/o THE RAILWAY GAZETTE, 33, Tothill Street, London, S.W.1.

WANTED FOR INDIA.—Personal Assistant to General Manager. A vacancy offering exceptional prospects of rapid promotion, occurs with one of the largest Engineering Works of repute in India, engaged on general engineering work and having foundry, railway rolling stock and bridge and structural departments, for a mechanical engineer with experience of Works management. Applicants should be about 38 years of age, of good general and technical education, and should have had similar experience in a well-known engineering works in Europe. Salary according to qualifications (about £115 per month) with five years agreement, free passages, provident fund, and generous Home leave on renewal of contract.—Apply, by letter, with copies of testimonials, and details of experience, stating age, and whether married or single to Box No. 207, c/o THE RAILWAY GAZETTE, 33, Tothill Street, Westminster, S.W.1.

South Indian Railway Company Limited

THE directors are prepared to receive Tenders for the supply of :—

COPPER PLATES

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company, Limited, marked "Tender for Copper Plates," with the name of the firm tendering, must be left with the undersigned not later than 10 a.m. on Friday the 27th August, 1937.

The Directors do not bind themselves to accept the lowest or any tender.

A charge, which will not be returned, will be made of 5s. for each copy of the Specification.

Copies of the drawings may be obtained at the Offices of the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, London, S.W.1.

E. A. S. Bell,
Managing Director.

91, Petty France,
Westminster, S.W.1.
4th August, 1937.

Improving the Amenities of L.N.E.R. London Termini

As part of a most commendable scheme for the improvement of 900 stations in the Southern Area of the L.N.E.R., the London termini of the company are receiving special attention. At King's Cross the congestion and inconvenience caused to passengers, especially in the circulating area, owing to the heavy parcels and mails traffic dealt with, will be eliminated by a complete revision of the system under which this traffic is now handled. During 1936 11½ million separate parcels were dealt with at this station, an increase of nearly 40 per cent. in five years. A new building is to be erected on a site adjacent to the main station, with an entrance in Upper Edmund Street, which will serve as a depot for the Post Office mail traffic together with that part of the forwarded parcels traffic at present dealt with in the office at the north end of the station approach. The bulk of the parcels traffic will still be handled in the office on No. 10 platform, but by absorbing adjoining offices the accommodation will be practically doubled.

The most important part of the scheme is the construction of a subway between the new mail depot and the enlarged parcel office underneath the station, to platform No. 1 with seven connecting lifts to the various intermediate platforms, which will practically eliminate the barrowing of parcels and mail traffic over the various platforms and the circulating area. When the subway is complete the whole of the traffic will be handled underground and be raised to platform level by means of the lifts. The dining car stores will also be moved by this route. In order to provide more platform space the staircases on the north side of the overbridge spanning the station are to be removed and the south staircase serving platforms 5 and 6 is to be reduced in width.

The improvement of the amenities of Marylebone station is also in hand, and alterations are being effected in the enquiry office, booking hall, and circulating area. The waiting rooms are also receiving treatment, particularly the accommodation for ladies, where a most attractive and entirely new room is being constructed, combined with modernised lavatory facilities.

At Liverpool Street station the waiting rooms and lavatories will be modernised. Attractive schemes of decoration, furnishing and lighting will be introduced, whilst the lavatory accommodation for ladies is to be entirely rebuilt and enlarged, embodying as a new feature a well equipped dressing room. In the booking halls, an improved system of lighting is to be installed, and a new front will be provided for the west side suburban booking office with ticket windows of plate glass in stainless steel frames. A further improvement of the west side will be effected by the removal of a portion of the wall near the top of the new stairway leading from the Central London Line, in order to facilitate the circulation of passengers in this busy booking hall and, at the same time, give it a much lighter and airier appearance. The circulating area between platforms 9 and 10 (from which the majority of the main line trains depart) will be brightened up considerably by tiling sections of the wall, and by the provision of tastefully designed advertisement panels and modern lighting. On the platform barrier posts extensions will be fixed which will carry illuminated signs giving the numbers of the platforms.

On the east side of the station two new and attractive shops are to be erected, and the transference of the lost property office to another site will provide the necessary space for extension of the refreshment rooms. Another feature of the scheme is the installation of groups of modern automatic machines and additional post office telephone boxes. Attention has been given to the location of commercial advertisements, and the result has been the creation of several prominent advertising sites, including positions for attractive new show-cases. The display of signs and notices intended for the information and guidance of passengers will be entirely revised with a view to securing simplification and greater lucidity for passengers.

Railway Share Market

Following the recent improvement in the stock and share markets, most sections of the Stock Exchange reflected profit-taking sales this week. Home Railway junior stocks were influenced by the general tendency and also by a diminution of speculative interest now the half-yearly statements have been published.

The excellent traffic figures, which were due largely to the good holiday weather conditions last week, brought about a firmer tendency on Wednesday, but prices have reacted somewhat sharply on balance. Sentiment has been affected by the large increase in expenses indicated by the L.M.S. figures for the past half-year, but it is generally assumed the company is following a particularly conservative policy in laying aside large sums for renewals, and that consequently it will be fully justified at the end of the year in distributing earnings on the ordinary stock on a liberal basis. The latter has declined sharply in price on the week, but is expected to remain prominently active on anticipation of a dividend of at least 1½ per cent. for the year. The 4 per cent. preference and 1923 preference stocks have not held best prices and continue to be regarded as moderately priced in many quarters. The raising of the half-yearly dividend on Great Western ordinary from ¼ per cent. to ½ per cent. created a favourable impression. The railway's traffic figures for the past week were in excess of market expectations, but the price of the stock was lower at 65½. Southern deferred and preferred were also lower at around 23⅛ and 94 respectively, although later the good traffic return brought in buyers. L.N.E.R. preferred and deferred were reactionary. The second preference was favoured and was probably steadier than any other of the junior stocks of the main line railways. The general belief in the market is that, granted the railway's rate of progress is continued in the current half year, a satisfactory improvement in the second preference dividend is likely, and that if all goes well and the industries of the North East Coast remain active, the price may show a substantial advance in 1938. London Transport "C" again made a better price. Argentine Railway stocks were aided by reports of continued improvement of economic conditions in Argentina. The ordinary and preference stocks of the B.A. Gt. Southern were in larger demand and moved in favour of holders. Cordoba Central debentures were also a good feature.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1936-37	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1936	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1936	Prices: Lowest 1936	Prices: Aug. 4, 1937	Prices: Yield % (See Note)
				£	£		£	£	£					
South & Central America	Antofagasta (Chili) & Bolivia	834	1.8.37	19,880	+ 6,660	31	504,120	417,300	+ 86,820	Ord. Stk.	25	15¼	20	Nil
	Argentine North Eastern	763	31.7.37	10,658	+ 529	5	45,695	41,987	+ 3,708	"	12	2	10½	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	54	45	85	4 11/16
	Bolivar	174	June, 1937	5,700	— 500	26	35,000	41,000	— 6,000	6 p.c. Deb.	9	5	8½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	16	11½	15½	3¼
	Buenos Ayres & Pacific	2,806	31.7.37	81,700	+ 6,934	5	365,199	339,915	+ 25,284	Ord. Stk.	17½	6	11	Nil
	Buenos Ayres Central	190	17.7.37	$156,800	+ $45,800	3	$375,800	$266,600	+ $109,200	Mt. Deb.	31½	11	30	Nil
	Buenos Ayres Gt. Southern	5,084	31.7.37	129,404	+ 20,973	5	537,655	486,336	+ 51,319	Ord. Stk.	31¾	13¾	26	Nil
	Buenos Ayres Western	1,930	31.7.37	47,333	+ 3,890	5	201,551	179,871	+ 21,680	"	29¾	11	23½	Nil
	Central Argentine	3,700	31.7.37	143,480	+ 8,064	5	669,810	581,250	+ 88,560	"	32 32	8¾	26	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	21	4½	12½	Nil
	Cent. Uruguay of M. Video	980	24.7.37	15,868	+ 1,412	4	53,143	53,114	+ 29	Ord. Stk.	7¾	3	6	Nil
	Cordoba Central	1,218	31.7.37	42,680	+ 3,390	5	191,130	172,150	+ 18,980	Ord. Inc.	5	1	4 1/2	Nil
	Costa Rica	188	May, 1937	25,954	+ 8,505	48	218,282	159,922	+ 58,360	Stk.	36½	32	34 1/2	5 13/16
	Dorada	70	June, 1937	14,000	+ 400	26	90,400	79,300	+ 11,100	1 Mt. Db.	107	101½	104½	5½
	Entre Rios	810	31.7.37	14,001	+ 1,460	5	62,599	54,729	+ 7,870	Ord. Stk.	17	6	11	Nil
	Great Western of Brazil	1,092	31.7.37	6,300	— 100	31	223,000	236,900	— 13,900	Ord. Sh.	1/2	5/16	1/2	Nil
	International of Cl. Amer.	794	June, 1937	$417,942	+ $38,950	26	$3,205,632	$2,996,509	+ $209,123	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/2	-/6	1/2	Nil
	La Guaira & Caracas	22¼	June, 1937	5,370	+ 910	26	33,705	27,340	+ 6,365	Stk.	9	3	7½	Nil
	Leopoldina	1,918	31.7.37	25,774	+ 4,610	31	687,302	537,125	+ 150,177	Ord. Stk.	10½	3½	5	Nil
	Mexican	483	31.7.37	$452,300	+ $77,700	5	$1,261,900	$1,054,600	+ $207,300	"	1¼	1/4	1/2	Nil
	Midland of Uruguay	319	June, 1937	9,168	+ 1,677	52	105,596	86,425	+ 19,171	"	1½	1/8	1/2	Nil
	Nitrate	384	31.7.37	5,613	+ 672	31	95,366	80,996	+ 14,370	Ord. Sh.	63/6	41/9	2⅝	Nil
	Paraguay Central	274	24.7.37	$3,393,000	+ $989,000	4	$13,288,000	$9,211,000	+ $4,077,000	Pr. Li. Stk.	85	71	81½	7⅞
	Peruvian Corporation	1,059	June, 1937	79,279	— 3,845	52	987,424	949,493	+ 37,931	Pref.	15	9	10½	Nil
	Salvador	100	24.7.37	¢11,500	+ ¢3,355	4	¢41,982	¢38,188	+ ¢3,794	Pr. Li.Db.	18	16	22½	Nil
	San Paulo	153½	25.7.37	36,225	+ 2,358	30	970,129	883,361	+ 86,768	Ord. Stk.	86	46½	58½	5⅝
	Taltal	164	June, 1937	3,115	— 1,105	52	41,035	42,725	— 1,690	Ord. Sh.	1 15/32	14/-	1 1/8	8⅞
	United of Havana	1,353	31.7.37	21,593	+ 7,176	4	83,976	73,124	+ 10,852	Ord. Stk.	3¼	1	3	Nil
	Uruguay Northern	73	June, 1937	836	+ 34	52	11,695	9,941	+ 1,754	Deb. Stk.	5	3	9	Nil
Canada	Canadian National	23,773	21.7.37	740,876	+ 62,655	29	21,195,712	19,115,585	+ 2,080,127	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—4 p.c.	Perp. Dbs.	76	51	68	5⅞
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104¾	99¾	100½	4
	Canadian Pacific	17,228	31.7.37	808,400	+ 31,800	31	15,766,400	14,724,400	+ 1,042,000	Ord. Stk.	16¾	10 16/16	12½	Nil
India†	Assam Bengal	1,329	10.7.37	36,165	+ 3,369	14	359,765	343,056	+ 16,709	Ord. Stk.	87¾	82¼	75½	4
	Barsi Light	202	10.7.37	2,752	— 1,388	14	32,677	38,932	— 6,255	Ord. Sh.	77½	65½	48	10 7/16
	Bengal & North Western	2,111	30.6.37	80,042	+ 8,009	13	813,620	754,128	+ 59,392	Ord. Stk.	319	292⅝	307	5⅞
	Bengal Dooars & Extension	161	10.7.37	4,043	+ 486	14	34,791	33,443	+ 1,348	"	127½	118	97½	5⅝
	Bengal-Nagpur	3,268	10.7.37	189,600	+ 33,143	14	2,016,332	1,811,392	+ 204,940	"	104	100¼	90½	4 7/16
	Bombay, Baroda & Cl. India	3,072	20.7.37	198,450	+ 7,950	16	2,923,800	2,702,025	+ 221,775	"	114	110½	111½	5⅜
	Madras & Southern Mahratta	3,229	10.7.37	144,225	— 11,131	14	1,659,938	1,656,741	+ 3,197	"	116½	108½	108½	7⅜
	Rohilkund & Kumaon	561	30.6.37	13,561	+ 1,578	13	156,138	158,706	— 2,568	"	311	286	309	5 13/16
	South Indian	2,531½	30.6.37	120,249	+ 12,595	13	1,060,241	1,048,729	+ 11,512	"	107½	102 5/16	100½	5½
Various	Beira-Umtali	204	May, 1937	84,161	+ 13,984	35	585,391	513,150	+ 72,241	—	—	—	—	—
	Egyptian Delta	620	10.7.37	7,034	+ 725	14	62,818	57,476	+ 5,342	Prf. Sh.	21/4	16⅜	13⅜	Nil
	Great Southern of Spain	—	—	—	—	—	—	—	—	Inc. Deb.	11½	1⅜	3½	Nil
	Kenya & Uganda	1,625	May, 1937	216,935	— 20,539	22	1,334,126	1,229,899	+ 104,227	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50½	37	47	7 7/16
	Midland of W. Australia	277	May, 1937	11,590	— 359	48	144,239	149,411	— 5,172	Inc. Deb.	97	93½	95	4 5/16
	Nigerian	1,900	12.6.37	50,741	+ 27,476	11	630,187	326,213	+ 303,974	—	—	—	—	—
	Rhodesia	2,451	May, 1937	411,689	+ 122,936	35	2,932,177	2,295,006	+ 637,171	4 p.c. Db.	107	103½	107½	3¾
	South Africa	13,263	10.7.37	658,419	+ 64,168	15	9,084,814	8,466,973	+ 617,841	—	—	—	—	—
	Victoria	4,774	Dec., 1936	890,287	+ 23,292	26	4,885,827	4,826,292	+ 59,535	—	—	—	—	—
	Zafra & Huelva	112	May., 1937	12,899	+ 4,079	22	70,216	48,574	+ 21,642	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

Speed—By Steam and by Diesel

THE recent developments of high-speed steam trains in this country, Europe, and America, need not be taken as an indication that these trains are now the equal of diesel units in their ability to maintain economically long or short distance super-speed schedules. Even in seating capacity there is no reason why a diesel train should not provide the same seating, dining, and sleeping accommodation as any of the well-known steam streamliners, and the operation of such trains may be attributed to causes other than maximum operating and design efficiency. On services such as the Silver Jubilee and Coronation on the L.N.E.R., a 1,200 b.h.p. three-car diesel train of the type used by the German State Railway could maintain easily schedules of 133 min. from King's Cross to York start-to-stop, or 208 min. from King's Cross to Newcastle including a 2-min. stop at Darlington, and as two or more such trains can easily be coupled in multiple-unit there is no real limit to the seating capacity. A special design could easily give all the facilities provided by existing supplementary-fare steam trains. Moreover, the riding of the diesel trains would be at least no less comfortable (witness the extremely smooth travel of the German trains) and certainly no less safe, and the effect on track maintenance would probably be less. With the numerous very fast steam-worked schedules, the everyday maximum speeds are not far off the limit attainable regularly with high centre of gravity locomotives. Thus, faster booked speeds can hardly be expected in this country, failing the introduction of diesel units.

The Railcar Position in France

IT is questioned sometimes whether railcars are so successful as they are made out to be, but postulating a sensible use of them by the traffic department there is no reason why they should not prove a distinct asset to the railway as a whole. Whatever failures or difficulties may occur—and no form of traction is without them—it is a pointer to thoroughly reliable service when railcars are to be found not in tens and dozens but in hundreds. France is one of the finest examples in this category, for the five main line companies have in traffic approximately 600 railcars, and there appears to be no slackening in the rate of construction. In addition, many of the secondary railways use four-wheeled and bogie cars of up-to-date design. On the five big systems a daily total of 140,000 km. (87,000 miles) is covered by railcars, ranging from 74 m.p.h. schedules down to local services in sparsely populated districts. Of the various makes the most popular is the Renault, of which there are 184 in service in powers of 250 to 300 b.h.p.; 15 double-unit trains of 500 to 600 b.h.p., and a handful of single-unit cars of 500 b.h.p., all of which have mechanical transmission. Other popular types are the Bugatti (75 vehicles), Michelin (92), and the so-called "standard" car (51). There has been a tendency for the power per car to rise; for example, the double-engined Saurer-Decauville 600 b.h.p. cars on the P.L.M., the double-engined 530-600 b.h.p. standard cars; and the 500 b.h.p. Renault single cars. The highest power-weight ratio is borne by the Michelin and Bugatti cars, the standard 56-seater Michelin weighing about 14 tons gross having an engine of 250 b.h.p. Electric transmission has comparatively few applications, but for the larger cars it is being used to some extent (Saurer-Decauville 600 b.h.p. on the P.L.M. and 500 b.h.p. Corpet-Louvet on the Etat). The engines are of a variety of four-stroke types, but there are numerous installations of the two-stroke opposed-piston C.L.M.-Junkers engine in its 110 b.h.p. size, and the 250 and 500 b.h.p. models are now coming into use.

A Canadian Conversion

DESPITE the early and successful application of oil engines to railcars and locomotives on the Canadian National Railways, diesel traction has not hitherto been tried on the rival Canadian Pacific Railway, and in a paper read only a few weeks ago, Mr. H. B. Bowen, the Superintendent of Motive Power, showed himself to be not greatly impressed by its possibilities on his system. Nevertheless an oil-engined railcar has been set to work, and an oil-electric locomotive is under construction. Both types are powered by Harland-B. & W. two-stroke engines. Actually, the railcar is a conversion from a petrol unit, opportunity having been taken to rebuild it with a diesel engine after it had been damaged by a fire. The engine is of the eight-cylinder type and gives a rated output stated to be 400 b.h.p. at 1,000 r.p.m. at a height of 2,000 ft., so it would appear that it is intended for operation in the Rocky Mountain divisions. It was considered essential that the new oil engine should fit into the existing engine room, and actually the diesel occupies slightly less space longitudinally than the petrol engine. The weight of the engine equipment installed in the engine room is less than 13,000 lb. against the limit of 15,000 lb. set by the railway, despite an increase in the size of the starting battery. As is usual with Canadian railcars, the engine cooling equipment is located on the roof. Particular attention has been paid to eliminating engine noise and vibration in the passenger saloon, and in this respect, as well as in such matters as fuel consumption, the rebuilt car is an improvement on its predecessor.

RAILCAR OIL ENGINES

A summary of the various makes now in use throughout the world

THE tremendous development of the railcar during the last two or three years has not been accomplished without an almost corresponding increase in the number of makes of oil engine used, but there is now a slackening in the introduction of new makes, although there are constant additions to the range of models turned out by established makers. There are over fifty different makes used in railcars at the present time, and the following summary gives the salient features of the most important of them. Certain types are used indiscriminately for railcars or locomotives but only those models which have been used in, or are being installed in, railcars are considered here.

Similar qualifications attach to the accompanying list of licensees of the leading railway oil engine makers:—

Maker	Licensee
A.E.C.	Breda.
Gardner	Miesse de Buysinghen.
	Kromhout.
M.A.N.	Soc. Gen. Constr. Mécanique.
	Acieries du Nord.
Junkers	Cie Lilloise de Moteurs.
Mercedes	Codra.
	Unic.
Saurer	Armstrong-Whitworth.
	O. M. Bresciana.
Ganz	Metropolitan-Vickers.
	Als-Thom.
	Stork Bros.
	Carels.
Sulzer	Armstrong-Whitworth.
Burmeister & Wain	Harland & Wolff.
Deutsche Werke Kiel	A.N.F.
Brno-Kralova-Polska	Simmering.

The Saurer and Sulzer engines are made by the parent companies' own works in both Switzerland and France, and the Junkers type has been used in railway work only as built by the French licensees, C.L.M. In the present instalment are described a number of railcar oil engines made in this country.

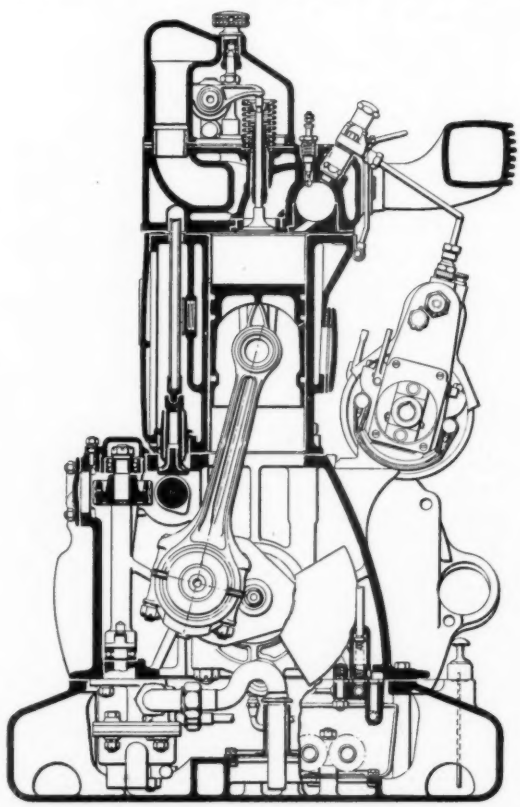
A.E.C.

The only model built by the Associated Equipment Co. Ltd. now applied to railcars is the six-cylinder 130 b.h.p. with the Ricardo head, but some early railcars (*e.g.*, on the Great Northern Railway of Ireland) have the old 115 b.h.p. engine. Developed from the engine used so widely in road transport, the railcar engine has several modifications, including a much larger sump of the dry type with a grid of Still tubes for oil cooling, and a cast iron crankcase in place of the old Elektron casting. The weight of the engine is about 12½ lb. per b.h.p. There are six cylinders with a bore and stroke of 4·53 in. by 5·59 in. respectively, and at the usual governed maximum speed of 2,000 r.p.m. the brake m.e.p. is 95 lb. per sq. in. and the piston speed is 1,865 ft. per min. Certain engines have the speed limited to 1,850 r.p.m. Idling takes place at about 400 r.p.m. C.A.V.-Bosch fuel injection equipment is fitted, and injects the fuel into a Ricardo spherical combustion chamber. A compression ratio of 16·5 to 1 is used, and the maximum cylinder pressure is about 785 lb. per sq. in. The nickel-steel hollow-bored crankshaft is balanced by prolongation of the webs and is carried in seven lead-bronze bearings 3·35 in. in diameter. The crankpins are 2.95 in. in diameter. The cylinder block is an integral casting, but the cylinder heads are cast in two blocks of three. The pistons are of heat-treated aluminium alloy with three pressure and two scraper rings, and run in cast iron dry liners which are inserted into the cylinder block by a special freezing process.

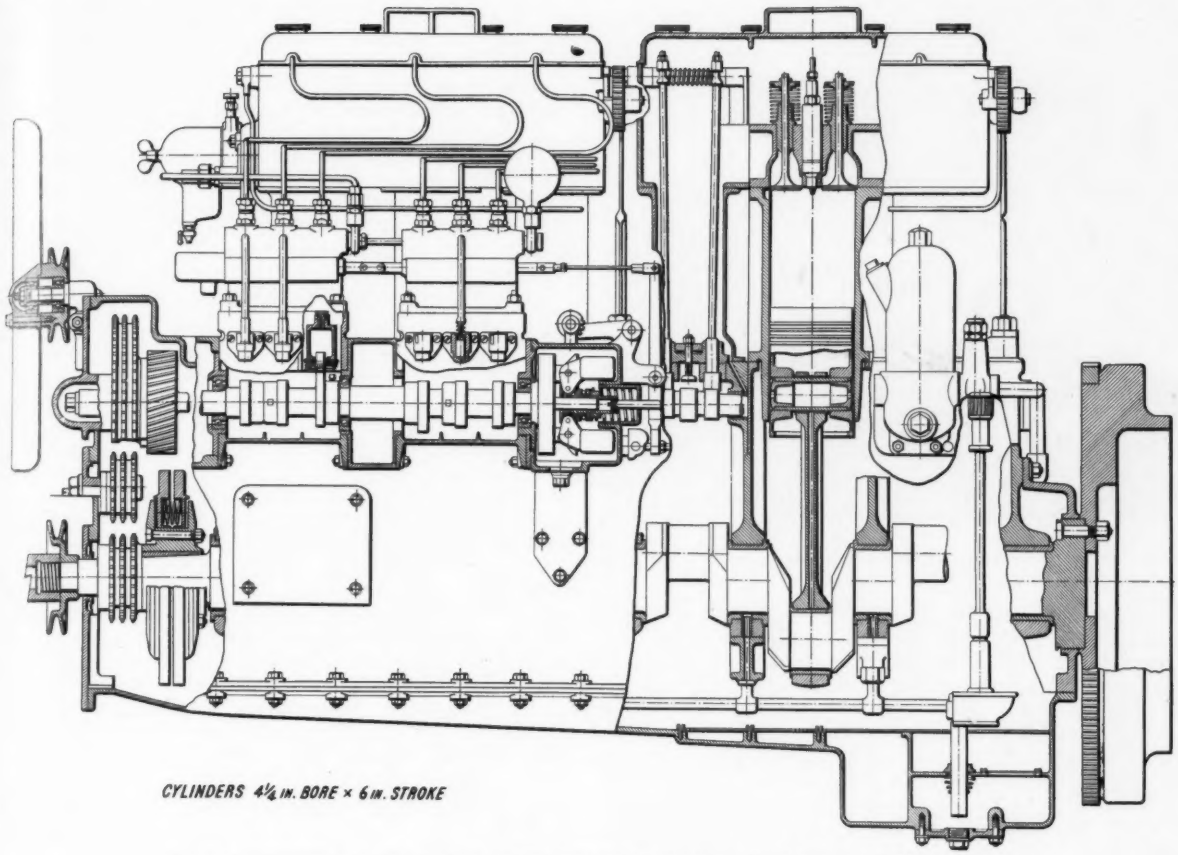
The cylinder heads carry the valves, valve springs, rocker arms, &c., and a single cover fits over the two castings and also incorporates the air intake manifold. The valves are operated through ball-ended push rods and rocker arms from a gear-driven camshaft in the upper part of the crankcase. Lubrication of the engine is effected by means of a gear-type pump. All the auxiliaries are mounted on one side of the engine and are easily accessible.

Gardner

Two types of Gardner engine are in general use in railway work, the L3 and the LW; the LW is the later design and is more generally applied for railcars nowadays, but the L3 type, made in powers up to 204 b.h.p. compared with the present limit of 102 b.h.p. for the LW design, is still used for vehicles beyond the capacity of the LW range. There is also available a smaller and higher speed range, the LK type, for powers of 50 b.h.p. or so. The cylinders of the LW type are 4·25 in. by 6·0 in. compared with the 5·5 in. by 7·75 in. of the L3 type, and the normal top speed is 1,700 r.p.m. against



Cross section of 130 b.h.p. A.E.C. engine with enlarged dry sump



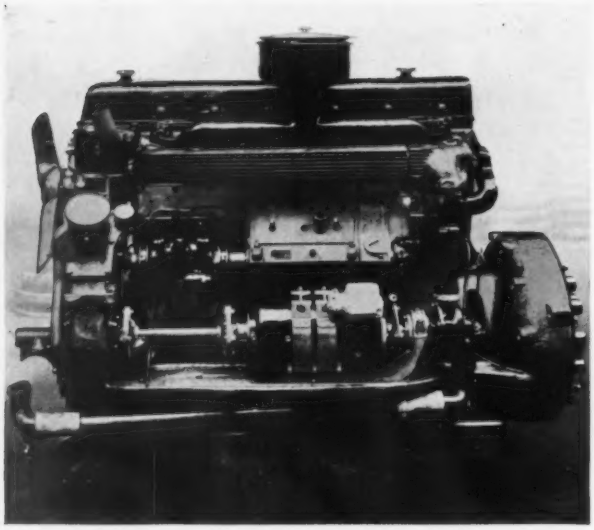
General arrangement of Gardner 6LW engine developing 102 b.h.p. at 1,700 r.p.m.

1,200 r.p.m. The 6LW engine, the biggest of its class, has a continuous rating of 90 to 96 b.h.p. at 1,400 to 1,600 r.p.m. according to the exact nature of the duty, and the top rating is 102 b.h.p. at 1,700 r.p.m. Over the full range of working the fuel consumption of the LW engines is below 0·4 lb. per b.h.p., and on the continuous rating the weight is about 16 lb. per b.h.p. The cylinder blocks of the LW engines are cast of a special iron in blocks of twos and threes and are bolted to a single-piece crankcase of aluminium alloy or Elektron. Steel bridge plates stretch across the crankcase and carry the main bearings. Hardened liners of the dry type are inserted in the cylinder barrels and the heads are cast of iron in blocks to correspond with the cylinder castings. Fuel injection is by C.A.V.-Bosch pumps operated from a small camshaft driven by gears from the main camshaft. The pump rams force the fuel at a pressure of about 2,500 lb. per sq. in. through special Gardner fuel injectors into a plain combustion chamber, this direct injection without resort to a pre-combustion chamber or air cell being one of the principal features of the Gardner design. A detailed description of the Gardner engines appeared in the issue of this Supplement for March 19 last.

Leyland

Another type developed directly from road practice, the Leyland engine, is used in two sizes for railway work, viz., 95 and 130 b.h.p. In the former size it is installed in the three four-wheeled cars of the L.M.S.R.; in the bigger model it is used on the L.M.S.R. (Northern Counties Committee) and to an increasing extent on the New Zealand Government and other railways. The smaller model is rated at 90 to 95 b.h.p. at 1,850 r.p.m., and develops its power in six cylinders 4·375 in. bore by 5·5 in. stroke; it weighs about 17·5 lb. per b.h.p. The cylinder block is a single piece, of hard-wearing chromium cast iron, and does not contain any liners. Nowadays the crankcase is made of cast iron, but for road work it is still of a heat-treated aluminium or magnesium alloy. The cylinder heads are formed of a single casting and do not contain any recessed form of combustion chamber, but the piston crown is dished at the centre to provide

Cylinder heads of a Gardner LW engine



95 b.h.p. Leyland oil engine

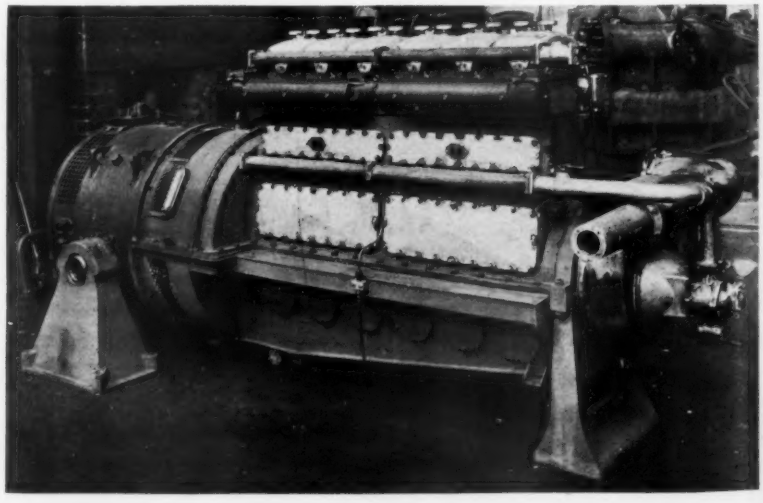
a combustion chamber giving the desired turbulence. Fuel injection is through C.A.V.-Bosch pumps and valves. The pistons are of heat-treated Y-alloy and through nickel steel connecting rods drive a hollow-bored crankshaft of the same material. The seven main bearings and the six crankpins are all of 3 in. diameter. The 130 b.h.p. engine has a piston-swept volume of 9·9 litres compared with the 8·6 litres of the 95 b.h.p. engine, and weighs about 16 lb. per b.h.p. Its six cylinders have a bore and stroke of 4·625 in. by 6·0 in. and the rated output is developed at 2,000 r.p.m. The general lines of the construction follow those of the 95 b.h.p. engine, but the cylinder heads are cast in blocks of three and the cylinder blocks contain dry liners. The crankshaft bearings are of 3·5 in. diameter, and are carried by the cast iron crankcase, which is brought down well below the crankshaft centre line and is provided with flanges on either side to which the bearings are tied by internal ribs. The bearing bolts pass right through the cylinder block. As with the smaller model, the idling speed is about 450 r.p.m., and is controlled by a C.A.V.-Bosch governor.

The connecting rods are of I-section alloy steel. The big-end bearings are of lead-bronze on the pressure side and of whitemetal on the caps; the small ends have bronze bushes. Heat-treated Y-alloy is used for the pistons, which carry three pressure and two scraper rings. Each cylinder head contains one inlet and one exhaust valve which are driven through the usual type of push rod and rocker by a camshaft located in the crankcase. Water is circulated from the radiator by an engine-driven pump to the cylinder heads and thence through large water spaces round the valve pockets. The usual radiator used in conjunction with Leyland engines has vertical gilled tubes and top and bottom headers of cast aluminium.

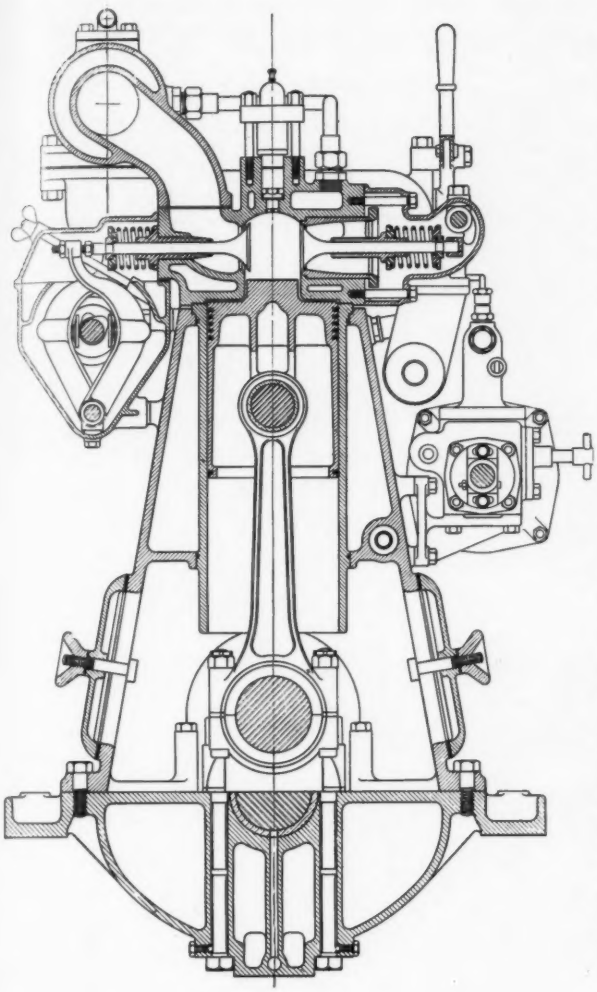
English Electric

Up to the present the applications of the English Electric engines built at the old Willans works at Rugby has been more in the field of heavy shunting locomotives, but actually the first railway installation was to the 200 b.h.p. railcar which ran extensive trials on the L.M.S.R., and the same type of engine, with modifications suggested by service, is now being applied to the three four-car diesel-electric trains being built for the Ceylon Government Railways. The output of the six cylinder model for the Ceylon trains is 180 b.h.p. at 1,350 r.p.m. and the normal maximum capacity 220 b.h.p. at 1,500 r.p.m. The weight is about 25 lb. per b.h.p. on the continuous rating. The cylinders have a bore and stroke of 6·0 in. by 8·0 in. and at the top output the brake m.e.p. is 78 lb. per sq. in. and the piston speed 2,000 ft. per min. The crankcase is of cast steel and cylinder block of close grain cast iron, bored to receive cast iron liners. The cylinder heads are cast separately of a heat-resisting iron, and each contains two inlet and two exhaust valves actuated from one camshaft. Carried in seven whitemetal-lined bearings, the crankshaft is a single forging, hollow-bored throughout. A carbon steel with an ultimate strength of 35 tons per sq. in. is used for the drop-stamped connecting rods, which are connected to aluminium alloy pistons through fully-floating gudgeon pins. The fuel pump is of Bosch manufacture, and the speed control equipment is of English Electric manufacture. The injection is direct, through a central multi-hole nozzle, round which the piston crown is dished. The engine bedplate carries also the main generator, and is suspended at three points on spherically mounted bushed connections in trunnions.

The trunnions are mounted in the underframe on rubber. The engine is equipped with a self-contained lubricating oil pump and filter, water pump, inlet air silencers and cleaners. A vibration damper is fitted at the front end



The original English Electric four-stroke six-cylinder engine developing 200 b.h.p. at 1,500 r.p.m. With improvements from modern practice, this type of engine is now being installed in diesel-electric trains for Ceylon



Cross section through Gleniffer engine

of the crankshaft and the engine is free from major criticals throughout its speed range.

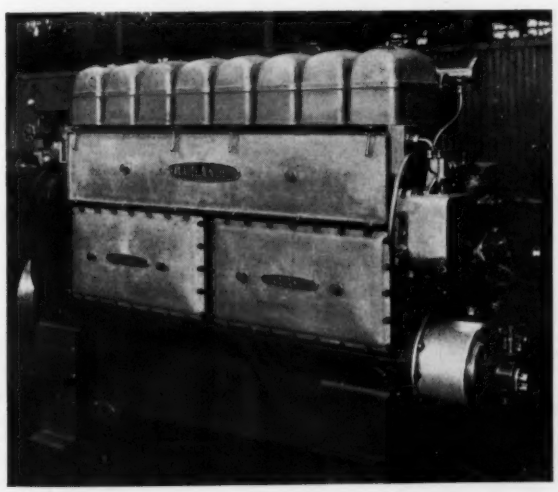
Gleniffer

This engine is like the English Electric designs in that up to the present locomotives have formed the principal application, the only railcar installation being that on the Great Northern Railway of Ireland. Several sizes are available, of which the 8-cylinder 160 b.h.p. model will serve as an example. The cylinders have a bore of 6·0 in. and a stroke of 7·0 in., and the continuous output of 160 b.h.p. at 900 r.p.m. gives a brake m.e.p. of 89 lb. per sq. in. and a piston speed of 1,050 ft. per min. Cast iron is used for the crankcase and cylinder block, which are separate pieces bolted together, and also for the cylinder heads. Wet liners of a hard wear-resisting cast iron are used. The crankshaft is carried in nine bearings consisting of gunmetal shells lined with whitemetal, and this type of bearing is used also at the connecting rod big ends. The valves are horizontal and are contained in a narrow vertical combustion chamber; the inlet valve is arranged in a cage, and by removing this cage and its valve the exhaust valve can be withdrawn. The camshaft is driven by duplex roller chains, and is bolted together in sections, one section for each cylinder. Hard aluminium alloy is used for the pistons, which have one scraper and five pressure rings. The gudgeon pin is hollow of casehardened steel, and is of the fully floating type. The constant-stroke fuel pump is of Gleniffer's own make and is operated from the camshafts through rollers and tappets. The fuel is filtered first by passing through an Auto-Klean strainer, and then through a fine-mesh monel metal gauze. An Auto-Klean strainer is fitted also to the lubricating oil circuit, which operates normally at a pressure of 15 to 25 lb. per sq. in. Gleniffer also has a range of engines developing 12 b.h.p. per cylinder at 1,000 r.p.m., the cylinders being 4·75 in. by 6·0 in., but of course the maximum power of such engines is limited.

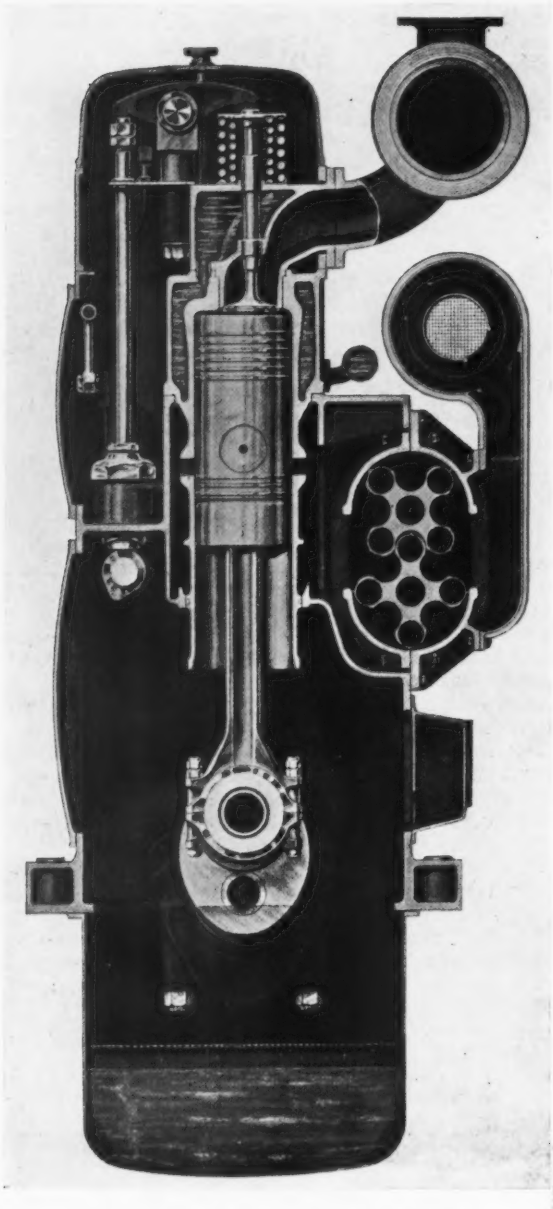
Harlandic

The two-stroke engines built by Harland & Wolff Limited under licence from Burmeister & Wain are used in both locomotives and railcars, and the available range is from 65 to 735 b.h.p., the speed falling from 1,250 r.p.m. in the small sizes to 650 r.p.m. in the largest models. Most of the engines installed so far have been in the medium power range—250 to 500 b.h.p. Although the constructional features of most of the engines are similar, the cylinder sizes vary, there being four different bore and stroke ratios available in four- to eight-cylinder engines. The ten engines shipped recently to New South Wales have eight 5·33 in. by 8·7 in. cylinders and develop a continuous output of 330 b.h.p. at 1,200 r.p.m. with a short-time rating of 360 b.h.p. On the continuous rating the piston speed is 1,735 ft. per min. and the brake m.e.p. 70 lb. per sq. in.; the weight is about 15 lb. per b.h.p., and this weight has been attained by the characteristics of the two-stroke principle and without resort to extensive use of aluminium alloys or injudicious paring of the scantlings. The engine is totally-enclosed.

Scavenging air is admitted through ports in the cylinder wall and, sweeping upwards, expels the burnt gases through a cam-operated valve in the cylinder head. The rocker shaft above the valve is carried on ball bearings. The scavenging ports extend right round the wall and thereby assist in maintaining a uniform temperature gradient and a reduction in the heat stresses. The fresh air charge is provided by a positive rotary blower comprised of two rotors each with four vanes working in a machined casing. The rotors intermesh without actually



360 b.h.p. eight-cylinder Harland-B. & W. engine as supplied to New South Wales



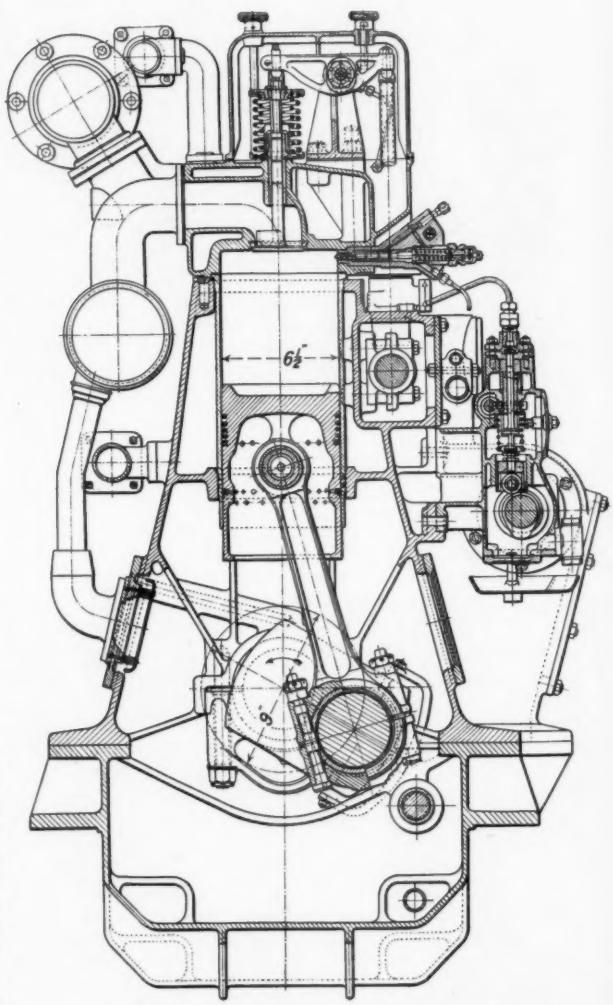
Cross section of 360 b.h.p. Harland-B. & W. two-stroke engine for rail traction

touching, and both are driven by external gearing. Welded steel construction has been adopted for the crankcase, which at the bottom is secured directly to the railcar frame members and at the top carries the cylinders and heads, which constituents are of cast iron in one piece and are dropped into the crankcase. Through bolts from the main bearing straps to the cylinder heads take the load. A light welded steel sump is attached to the bottom of the crankcase. The crankshaft is forged in one piece and is carried on seven bearings with white-metal linings run on steel shells. Both shaft and pins are hollow bored. The connecting rods are of alloy steel, and have white-metalled big ends and bronze-bushed small ends carrying fully-floating gudgeon pins attached to cast iron pistons. Separate Harland-B. & W. fuel injection pumps are fitted to each cylinder, and force the fuel through two nozzles located at opposite sides of the combustion chamber.

Various British Engines

Other engines in Britain, which are built under licence, such as the Metro-Vick-Ganz, Armstrong-Sulzer, and Armstrong-Saurer types, can be dealt with more conveniently later, when considering the engine range of the licensor. A further British engine, which has had a small railcar application in Poland, is the Thornycroft, which, of course, is simply that builder's well-known road transport engine with the necessary modifications. The 130 b.h.p. model develops its rated output at 1,700 r.p.m. in six cylinders 4·75 in. by 6·5 in. The cylinder block and crankcase are of monobloc construction and have cast iron liners in the barrels; the crankcase is of a light alloy. Another British engine, which in past years has gained a considerable reputation, is the Beardmore—almost the first high-speed railway oil engine, but unfortunately it is no longer in production.

(To be continued)



Cross section of 225 b.h.p. Beardmore engine of the last type

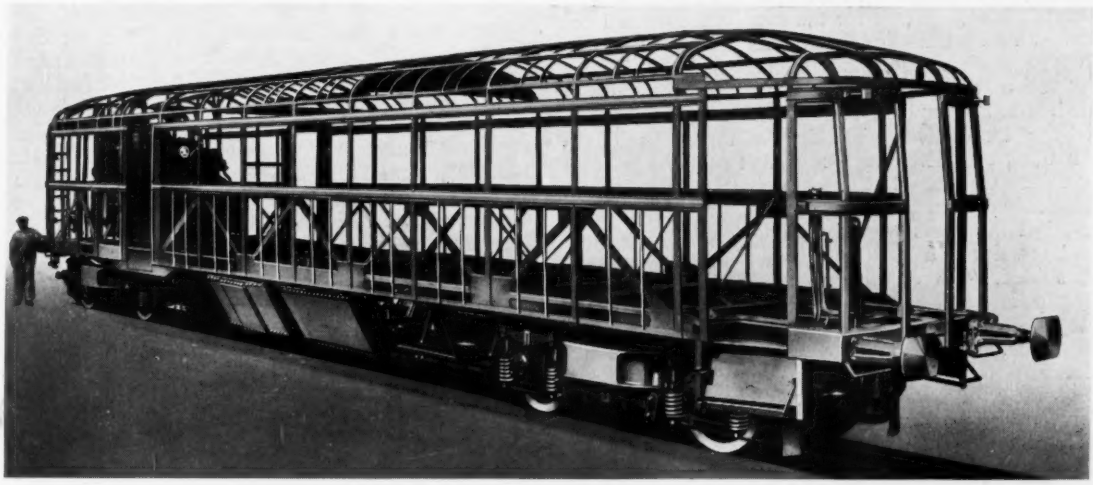
A Main-Line Railcar Design in Czechoslovakia

RECENT additions to the high-power section of the extensive railcar stock of the Czechoslovak State Railways include some diesel-electric vehicles built and engined by the Skoda Works, of Pilsen. They are fitted with multiple-unit control but the usual duties consist of one car hauling trailers of special light design. The top speed of 68 m.p.h. can be maintained on the level when hauling a train. The first cars of this design were built about two years ago.

The power unit is a six-cylinder four-stroke Skoda engine with a continuous rating of 400 b.h.p. at 1,000 r.p.m., this output being developed in cylinders having a bore and stroke of 230 mm. by 280 mm. (9·1 in. by 11·0 in.) respectively. The crankcase and cylinder block are of welded steel construction and cast iron liners are inserted in the latter. Fuel injection is by means of Bosch pumps delivering through Skoda injection valves. The governor is of the Jahns-Thoma hydraulic type and is chain-driven from the crankshaft; the same chain also drives the centrifugal cooling water pump. The radiators are located beneath the underframe and are provided with two fans driven by a 15 kW. motor.

Directly coupled to the engine, and mounted on the same bedplate, is an 8-pole d.c. generator with a one-hour rating of 600 amp. at 440 volts. It has a separately-excited shunt winding, an anti-compounding winding, and a series starting winding. On a frame above the generator are grouped auxiliaries, comprising a reciprocating air compressor for the brakes; a 1·5 kW. lighting dynamo, and a regulating dynamo with shunt and separate excitation. The two traction motors are on the bogie at the opposite end to the engine, and they are connected permanently in parallel; their one-hour rating is 300 amp. 440 volts at 650 r.p.m. and the torque is tranmitted to the axles through single reduction gears with Maag teeth. The electric control gives four engine speeds from 500 to 1,000 r.p.m. and also an idling speed of 350 r.p.m. Incorporated in the control is a Brown-Boveri dead-man handle. A Nife 96-volt alkaline battery is installed for starting and lighting purposes. Although there is a driving position at each end of the car, the engine can be started only from the position adjacent to it.

The body and underframe structure is an integral unit of welded steel, with the floor and roof members the main units. The outer steel panel plates and roof sheets are electrically spot-welded to the frame members, and the side sheets are prolonged downwards to form a curved skirt between the bogies. Steel castings are used for the bogie frames and swing-link bolsters; the bolster springs are of the laminated type, and the S.K.F. roller bearing axleboxes are supported by laminated springs and helical auxiliaries. The load-carrying principles of the two bogies differ, the bogie at the engine end taking the load through spherical side bearers, the pivot being used only for turning movement, whereas at the other end the spherical pivot shares the load with the side bearers. Both bogies are fitted with hydraulic shock absorbers to improve the riding. The wheels are of 39⅜ in. diameter and are spread over a bogie wheelbase of 8 ft. 2½ in., the bogies themselves being at a pitch of 44 ft. 11½ in. Pneumatic sanding and compressed air brakes are included in the equipment.



Body framing and bogies of diesel-electric car for main-line work

There are 56 upholstered seats in the car, and a luggage compartment at one end; in winter the passenger saloons are heated by a combination of engine exhaust gas and electric heating systems; the exhaust gas principle is used alone in milder weather. The tare weight is 50 tons, giving ratios of 8 b.h.p. per ton, 7 b.h.p. per seat, and 2,000 lbs. per seat.

RENAULT ENGINES.—The 12-cylinder vee Renault engines of 265 and 300 b.h.p., used in large numbers by the French and French colonial railways, run usually for 75,000 miles before being withdrawn for periodic general repairs, and some of the engines have run for almost 90,000 miles before repair, but as a matter of routine the fuel pumps are inspected and adjusted every 12,500 miles.

DIESEL LOCOMOTIVES UNDERGROUND

Interesting experiences in Continental mines with a variety of makes

THE use of diesel locomotives in mines and tunnels is much more general than usually is realised, more particularly on the Continent, where, in the Saar, Westphalia, Holland, and elsewhere there are very many four-wheeled diesel-mechanical units of 20 to 70 b.h.p. So long ago as 1886 a benzine locomotive appears to have been at work in a Hessian mine, but diesel locomotives are a post-war development, forced on mainly by explosions of petrol locomotives in Belgium, Lorraine and Germany.

New Dutch Locomotives

In the State Mines of Holland, some Kromhout diesel locomotives have been at work for 18 months, and recently a contract has been placed for the supply of further locomotives. This contract is of particular interest in that a British type of oil engine, the Kromhout-Gardner, is used in conjunction with another British product, the Vulcan-Sinclair hydraulic coupling, both of which were utilised in the first trial locomotives. The duty of these locomotives is the hauling of a long train of loaded coal trucks from the secondary workings to the main shafts. Previously, these duties had been performed by compressed air locomotives, but the hauls were becoming too long for such units to be retained unless intermediate re-charging stations were provided. In addition to saving the expense of lengthy pipelines and the trouble of stopping to re-charge, the adoption of diesel locomotives has meant that the number of traction units for a given amount of work could be reduced.

The engine of the new diesel locomotives is of the six-cylinder Gardner type made under licence at the Amsterdam works of Kromhout; its rating is 65 b.h.p. at 1,300 r.p.m. A special air filter has been fitted on the engine to prevent coal dust being carried through with the induction air. Only hand starting is used. Two of the principal reasons for the adoption and perpetuation of the Gardner type of engine were the large working range of speed and power and the low percentage of CO in the exhaust. A cast iron water box is fitted, through which the exhaust is passed before reaching the atmosphere, and there is also a special device to stop the oil engine automatically should the temperature of the exhaust be above a certain predetermined limit after it has passed through the water box. Tests showed that the CO percentage in the exhaust was as low as 0·058 per cent. at full load and 0·138 per cent. at no load; the CO percentage at no load was reduced to 0·06 per cent. if the exhaust and water temperature was allowed to rise. The engine cooling water is circulated through a fan-cooled radiator.

Protection of the engine from road and gearbox shocks, and the gradual taking up of the load, is effected by a Vulcan-Sinclair traction type hydraulic coupling mounted in the flywheel of the engine, and through which the torque is taken to a Hardy-Spicer cardan shaft and thence to a two-speed Bostock & Bramley gearbox, which gives track speeds of 4·2 and 8·9 m.p.h. An over-speed drive has been incorporated to give a track speed of 12 m.p.h. when engaged in hauling workers to or from the face. The speed gears are engaged by friction clutches and the forward and reverse gears by dog clutches. A second Hardy-Spicer shaft takes the drive from the gearbox to two Bostock & Bramley worm drives, one on each axle. The torque arms from the worm casings are taken to one point on the locomotive frame. There is a fully-equipped driving position at each end, and this in itself is rather unusual in mine locomotives. The locomotives are built upon frames one inch thick and all the machinery is enclosed by a casing $\frac{3}{8}$ in. thick. In working order the weight is 10·5 tons, and on the level trailing loads of 170 tons on the first gear step and 70 tons on the second step can be handled. The overall length is 17 ft. 4 in., the width 2 ft. 8$\frac{1}{2}$ in., and the height 5 ft. 3 in. The axleboxes are of the S.K.F. roller bearing type.

Operation Underground

Particularly valuable notes on the working of diesel locomotives underground are to be found in a report entitled "Diesel Mine Locomotives—Development and Use in European Coal Mines"* compiled by George S. Rice and F. E. Harris, and most of the following information is taken from that report. Safety is virtually the sole reason for the introduction of diesel locomotives, for in the years 1927-29 several explosions were traceable directly to petrol locomotives, and it is thought also that the Alsdorf disaster of 1930, in which 300 men were killed, may have been due to the same cause. Deutz and Junkers engined locomotives appear to be favourites, and the Deutz type is used extensively in the Saar. Five years ago a French report stated that 63 diesel locomotives had been at work in the Saar mines for a year and a half.

With a single exception, all these Saar locomotives operate in intake air with a sufficient volume and draught. Under such conditions the risk of CO poisoning is very slight, but it is worth noting that tests made under ordinary working conditions by these American observers showed that CO percentage ranged up to 0·5 per cent., which is a good deal more than in the tests in Holland; and this percentage was liable to increase if for any reason the excess air used by the engine was seriously diminished. According to the *Annales des Mines*, of Belgium, it is necessary to have a ventilating current of 7,000 to 10,000 cu. ft. of air per min. in an entry where a diesel locomotive is working.

Occasional trouble with fumes has been encountered in atmospheres with high humidity. For example, at Göttelborn, in the Saar, on one level there was a great quantity of water vapour in the diesel engine exhausts, which was not dissipated by the ventilating current because the humidity of the air in the haulageway was already very high. In consequence, the moist exhaust remained in suspension in this atmosphere and the end of the haulageway was obscured by a cloud of vapour, which had the characteristic odour of burnt oil. The ventilation was improved until the air current reached 50,000 cu. ft. a minute, and with this draught the air was clear, even with five diesel locomotives working in the haulageway. Accidental derangements of the intake and exhaust valves have occasionally caused an increase in the CO content and in one instance a case of slight poisoning occurred.

Two further points of prime importance are the behaviour of the engine in the presence of firedamp, and the thorough cooling of the exhaust. An explosion of fire-

* Bureau of Mines, U.S.A. Department of the Interior, Washington, D.C.

damp alone in the engine is practically impossible, and ignition of a firedamp atmosphere is possible only by the projection of flame through the intake or exhaust pipes. In exceptional cases where a combination of bad design and bad maintenance may allow the intake valve to remain open about the top dead centre, and the fuel ignition would create a blow-back of flame. Sometimes a labyrinth of plates is fitted in the induction system to prevent possible trouble in this direction. The cooling of the exhaust usually is effected in a water box and plate labyrinth which bring the temperature down below 70 deg. C. In some of the simplest installations for locomotives operating in non-gassy mines the exhaust is passed through a nest of pebbles or iron balls cooled by a water spray, and sometimes also through three or four sheets of safety-lamp gauze. With diesel locomotives of 25 to 40 b.h.p. with water boxes and plate labyrinths it has been found that about 22 gal. of water are used for exhaust cooling in two hours when the locomotive is working at its normal rated output.

A number of the diesel mine locomotives have engines with a single cylinder only, and while no undue trouble has been caused, there is evidence that such designs do make locomotive and permanent way repairs a little more expensive. Fuel injection valves, intake and exhaust valves and gudgeon pins appear to be the engine details requiring most attention in the locomotives at work in the Saar mines. The valves not only have a tendency to wear too quickly but also cause occasional stoppages at inopportune times. A certain amount of trouble has been experienced with friction clutches in the mines of Belgium and the Saar, and it was to eliminate such difficulties that the Vulcan-Sinclair hydraulic coupling has been preferred by the Dutch State mines. In the Saar, the fuel cost of a 24 b.h.p. diesel locomotive is only about 30 per cent. that of a 15 b.h.p. petrol unit, and the repair cost has been shown to be only 0·22 fr. per tonne-km. against 0·37 fr. for the petrol machine. The selling price of the diesel was about 60,000 fr., and for the first year of operation the maintenance charges amounted to an average of 867 fr., but it is estimated that after a few years service the annual maintenance and repair bill will be about 1,125 fr. plus 780 fr. for tyre replacements. At the time the Saar report was drawn up, the drivers were paid 51 fr. per shift and the skilled fitters 50·5 fr., the fitter's charge per shift averaging 12·6 fr. per locomotive shift. The overall cost per shift, including amortisation was 99 fr. per locomotive shift.

Belgian Experience

It was in 1929 that diesel locomotives were introduced into Belgian mines, and from that date ministerial instructions have permitted the substitution of diesel for petrol units without any new authorisation, but for gassy mines ministerial approval is necessary for the introduction of new oil-engined locomotives. Special tests of the behaviour of such locomotives have been made, more particularly as to the factor of safety when some or all of the safety devices were omitted or were out of order. For example, in practice the water spray for the cooling of the exhaust might be lacking owing to the pump stopping automatically, but this does not always cause serious results, even when the pebbles or iron balls were out. In normal work, however, all these devices are retained, although under test many locomotives have been run in a gassy atmosphere with only the water spray in operation, and as this brought the exhaust temperature down below 70 deg. C. no explosions occurred. It was observed that methane introduced with the air does not burn completely in the engine. With a percentage of 7·5 of methane at the intake, the exhaust contained 6·5 per cent.

Railcar Maintenance on the Italian State Railways

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THE method of upkeep of railcars belonging to the Italian State Railways is based on the kilometrage run, and a programme of shop visits and revision is allotted to each railcar by its home depot. Heavy or unusual repairs, however, are carried out at the regional shops, particularly where bodies are concerned; bogies go to the main workshops at Florence. All the modern railcars of the Italian State Railways have mechanical transmission.

When a bogie has completed a run varying from 100,000 to 200,000 km. (62,000 to 124,000 miles), and rising occasionally to 250,000 km. (155,000 miles) for certain types of car, it is sent to the Florence shops, whence it is returned after general inspection and any necessary repairs have been carried out. Theoretically each railcar depot is allotted a given number of spare driving bogies, for use while those sent to Florence are receiving attention, but it is general practice, as far as practicable, for every bogie to be allotted to a railcar, and it is carefully watched in service. For each bogie there is a register in which are written details of its service and particulars regarding the state of the principal parts, and the registers of two bogies mounted on one railcar are placed adjacent in the register of the railcar itself.

The main repair shops at Florence carry out every type of repair. There is undertaken the complete dismantling of bogies, and the renewal and repairs of their various component parts. Each part is tested, both during assembly and when mounted on the chassis. Bogie trials are conducted with great care to avoid any failure while running. The Florence shops are also responsible for the periodic and unusual repairs of the engines, dynamos, feed pumps and injection pumps. This centralisation of upkeep at Florence has brought about the creation of a workshop fitted with all the latest work and control methods, and manned by a trained staff to assure the carrying out of important and usually delicate repairs under the best conditions. This has been made possible by a high degree of specialisation.

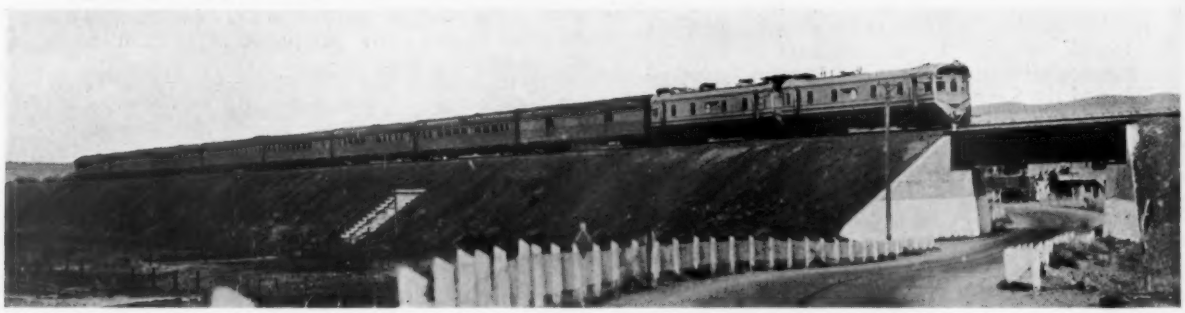
For new railcars, the Italian State Railways has given decided preference to diesel engines. These seem to present certain advantages over their petrol counterparts, and although slightly heavier, consume less fuel and run so well that it is rare that they cannot be in regular service.

The fuel used for the diesel engines is subject to much less risk of fire than the petrol type, particularly as regards inflammability and the spreading of flames. In order to avoid as far as possible the future importation of fuel, the Italian State Railways are now studying and testing railcars capable of running mostly or entirely on fuels of Italian origin. These new railcars are generally powered by two engines, which guarantees almost certain regularity in service, without at the same time increasing the problem of construction and the additional cost of purchase. The passenger capacity is generally 56 seated and 20 standing. This accommodation not only helps to maintain lightness of construction and a comparatively low first cost, but also meets the ordinary needs of service, in spite of the frequent connections. The cars are often coupled together when it is necessary to provide greater accommodation on certain days over heavily trafficked lines. This arrangement permits both driving and traffic staff reductions, thanks to the use of multiple-unit control. Experience in this domain has been entirely satisfactory.

The Three Stages of the Super-Chief

An epitome in pictures of the cross-continent luxury train of the Atchison, Topeka & Santa Fe Railroad (*see also back page*)

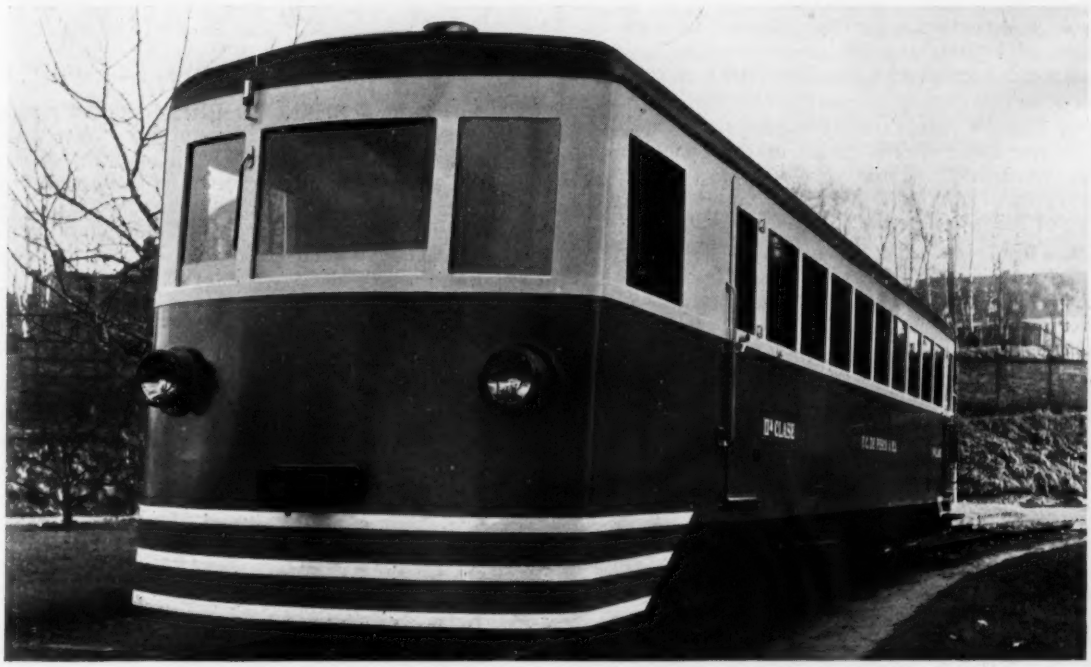
First: With the original 3,600 *b.h.p. diesel-electric locomotive and a* 600*-ton train of ordinary cars*



Second: With the original locomotive and the new eight-car stainless steel train, a trailing load of 380 *tons*

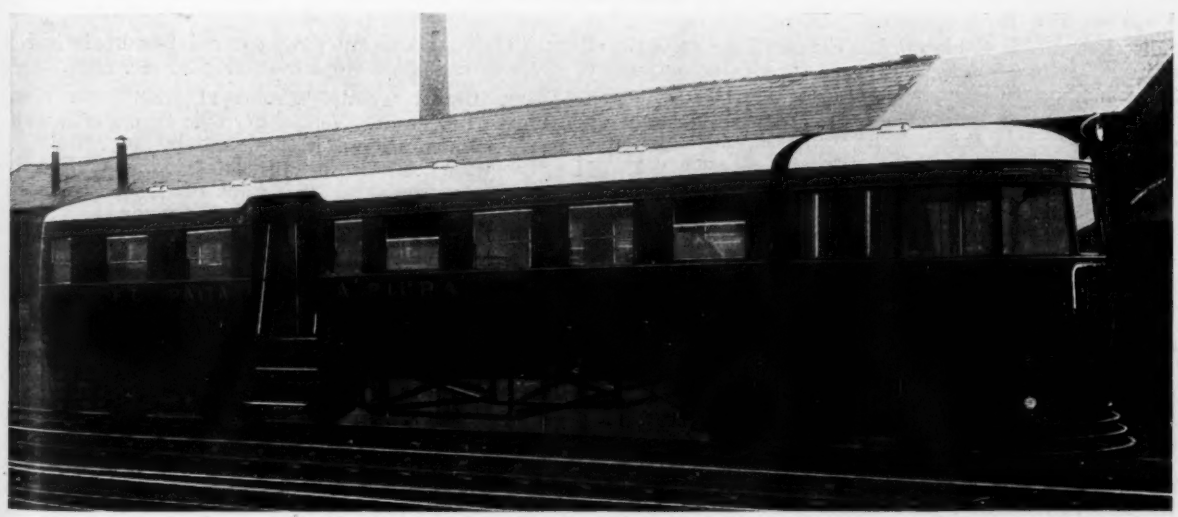
Third: The new 3,600 *b.h.p. streamlined light-weight locomotive hauling the new stainless steel train*

DIESEL RAILCAR TRACTION IN PERU



150 b.h.p. German-built car for the lines of the Peruvian Corporation

THE Peruvian Corporation is adopting diesel traction on some of its lines, and two standard-gauge double bogie railcars are now in service. The first, built by Walker Bros. (Wigan) Ltd., has a 102 b.h.p. Gardner engine and a Meadows four-speed gearbox, and is of the usual Walker power-bogie construction, with the car body articulated to the front bogie, and containing seating accommodation for 61 passengers. This car is operating on the Paita a Piura Railway; the chassis and bogies were illustrated and described in the issue of this Supplement for June 12, 1936. The second car runs on the Pisco a Ica Railway, and was built by M.A.N. It has an all-welded steel body and underframe and welded steel bogies, one of which carries a 150 b.h.p. M.A.N. engine and a Mylius four-speed gearbox. First and second class accommodation is provided. The car is 51 ft. 8 in. long overall and has 33½ in. wheels; the tare weight is 20 tons. Compressed air sanding is fitted, and compressed air brakes are used, whereas in the Walker car the braking is on the vacuum system. Neither car is intended for trailer haulage. The normal top speed of each car is in the neighbourhood of 50 m.p.h.



16-ton Walker railcar for one of the standard-gauge lines near the Pacific coast

NOTES AND NEWS

Torque Converters.—Leyland Motors Limited has now built 1,500 hydraulic torque converters of the Lysholm-Smith pattern for installation in railcars and road transport vehicles.

City of Denver Anniversary.—On June 18, the two *City of Denver* diesel-electric trains of the Union Pacific Railroad completed their first year of operation. During this period these two Winton-engined trains covered an aggregate of 765,000 miles and carried 129,259 passengers.

Railcars for Iran.—The illustration on this page shows one of the two diesel-electric railcars built by Nydquist & Holm A.B., Trollhättan, for the Iranian State Railways, the order for which was recorded in the issue of this Supplement for February 19 last, since which date changes in the proportions of the cars have been made. Intended for use on the northern line, extending from the shores of the Caspian Sea, these cars have Burmeister & Wain 8-cylinder two-stroke engines and Asea electric transmission. At sea level the normal output of each of the two diesel engines is 400 b.h.p. but the cars have to work at altitudes up to 6,900 ft., and at this height the output is 330 b.h.p. or 660 b.h.p. per railcar. The maximum ambient temperature is about 130 deg. F. The top speed is 43 m.p.h. and at this velocity the tractive effort is 3,850 lb. Accommodation is provided for 49 passengers within an overall length of 69 ft. and on a tare weight of 76 tonnes, of which 32 tonnes is available for adhesion. One axle of each bogie is driven by a traction motor with a continuous rating of 193 kW. The bogies have 39⅜-in. wheels spread over a base of 9 ft. 10 in., and are pitched at 47 ft. 6 in. centres.

The Super-Chief.—Elsewhere in this issue will be found a pictorial record of the Atchison, Topeka & Santa Fe Railroad's diesel-electric luxury train, the Super-Chief, which in the course of its 39¾-hr. journey from Los Angeles to Chicago covers the 202·4 miles from La Junta to Dodge City at a start-to-stop average of 83·7 m.p.h. This speed was reduced temporarily pending the delivery of the new lightweight stainless steel train and the new 3,600 b.h.p. locomotive, but it is understood that it is again in force. The train is built up of stainless steel on the usual Budd Shot-weld process, and has berth accommodation for 104 passengers with 42 seats in the lounges and 36 in the dining car, plus quarters for a crew of 12.

Winton Engine Plant.—The Electro-Motive Corporation has just opened a second extension to its diesel locomotive building plant at La Grange, Illinois, first opened in January, 1936. The new extension is to be used for the manufacture of the Winton two-stroke railway oil engine, and will supplement the capacity of the Winton plant at Cleveland. The Winton engines used up to the moment comprise 660, 900, and 1,200 b.h.p. sizes.

Luxembourg Railcars.—Two diesel-electric railcars rebuilt from pre-war petrol-electric railcars have been at work on the metre-gauge Diekirch—Vianden Railway in Luxembourg since last year. Each car is fitted with a 180-b.h.p. Deutz engine and Brown-Boveri electric transmission, and has a tare weight of 28 tons. Normally a 13-ton trailer is hauled, and the schedule over a 9-mile line with heavy grades and sharp curves is 29 min., inclusive of seven intermediate stops averaging 30 sec. each.

Standard-gauge 12-wheeled diesel-electric railcar for trailer haulage on the northern section of the Iranian State Railways

Italian Diesel Trials.—Prolonged tests have been undertaken by the Soc. Veneta Ferrovie Secondarie, with a diesel-mechanical railcar powered by a 170-b.h.p. M.A.N. engine and having the latest form of T.A.G. mechanical transmission. (See issue of this Supplement for March 19 last.) The running was mainly on the Venice (S. Lucia)-Mestre and Mestre—Piove—Adrica lines. The car can be used for trailer haulage, and seats 80 passengers on a tare weight of 29 tonnes. The top speed is 80 km.p.h. (50 m.p.h.).

More Italian Diesel Orders.—For operating over 1 in 14 and 1 in 10 grades now worked by steam rack locomotives, the Italian State Railways has ordered from Fiat a number of 56-seater diesel mechanical railcars without any rack equipment, and which are to be based on the standard Littorina design. These cars are estimated to tare 23 tons and will have two 115-b.h.p. Fiat engines running at 1,800 r.p.m , giving 10 b.h.p. per ton of weight. The speed up the 1 in 10 grades is to be a sustained 7·5 m.p.h., and on the level the designed rate is 43 m.p.h.